

Separation of Technetium from Nuclear Waste Stream Simulants

A Report by

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ABSTRACT

Members of the Strauss research group at Colorado State University acquired equipment and instrumentation necessary to carry out this project, including a Perkin-Elmer P-400 ICP-AES spectrometer. All members of the research team were trained in the proper protocols, procedures, and safeguards necessary to carry out this project. We evaluated several colorimetric assays for ReO_4^- , and discovered that all were flawed. We evaluated atomic absorption spectroscopy as a technique to determine sub-millimolar concentrations of ReO_4^- , and discovered that it is not sensitive enough for our use. However, we discovered that ICP-AES can be used to determine concentrations of ReO_4^- down to 0.25 ppm. We next determined that ReO_4^- can be quickly extracted (10 minutes or less) from aqueous HNO_3 using the commercial extractant Aliquat-336 nitrate diluted with 1,3-diisopropylbenzene. Higher concentrations of extractant led to higher values of K_d (the distribution ratio). K_d was lower as the nitrate concentration of the medium increased, and was also lowered by increasing the acidity at constant nitrate ion concentration. We performed parallel studies with TcO_4^- , determining that $K_d(\text{ReO}_4^-)$ and $K_d(\text{TcO}_4^-)$ track similarly as the conditions are changed. A considerable effort was made to prepare substituted pyridium nitrate salts that are soluble in organic solvents so that these could be used as alternate extractants. Over twelve different compounds were made and purified. However, in all cases but one, the salts were also soluble to some extent in the aqueous phase, significantly limiting their usefulness as extractants for our purposes. Many of the new extractant salts would partition between the organic solvent and water so that 10% of the extractant salt was in the aqueous phase. Only 1-methyl-3,5-didodecylpyridium nitrate (prepared from a sample of the chloride salt, which was prepared by Professor Richard Bartsch's group at Texas Tech University) did not show any measurable solubility in water. However, this compound was not as good an extractant as Aliquat-336. A considerable effort was also made to find suitable alternative solvents to 1,3-diisopropylbenzene. Several ketone solvents with flash points above 60°C were tested, and two of these, 2-nonanone and 3-nonanone, were superior to 1,3-diisopropylbenzene as a diluent (i.e., significantly higher K_d values were observed).

STATEMENT OF WORK

(written October 1993; updated July 1994)

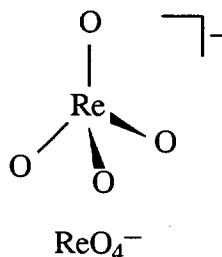
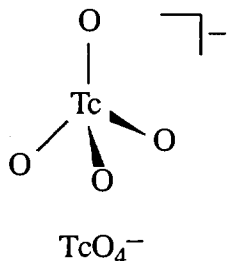
Separation of Technetium from Nuclear Waste Stream Simulants

INTRODUCTION

Approximately 5,600 kg of technetium (Tc) are present in the Hanford waste tanks, primarily as pertechnetate (TcO_4^-), which is a very mobile species in the environment. This characteristic, along with its long half-life (^{99}Tc , $t_{1/2} = 213,000$ a) makes technetium a major contributor to the long-term hazard associated with Hanford's low level waste (LLW) form, grout. For a variety of reasons, current grout technologies are incompatible with the presence of technetium. Instead, the *separation of technetium* from the LLW stream and *then vitrifying it* along with the high level waste components is the best alternative. In the near term, Initial Pretreatment Modules (IPMs) will be required to treat waste streams in order to mitigate safety concerns and to generate tank capacity. Since the IPM effluent is destined for the grout plant, complex pretreatment processes such as the "Clean Option" will require technetium separation from both acidic and caustic waste streams. A leading candidate technology for separating technetium is *liquid phase solvent extraction*. This Statement of Work details the research that the Strauss research group in the chemistry department of Colorado State University (CSU) will carry out to evaluate, develop, and improve this technology.

REQUESTED RESEARCH

The Strauss research group in the chemistry department of CSU will investigate the solvent extraction behavior of salts of the perrhenate (ReO_4^-) ion, a stable (non-radioactive) chemical surrogate for pertechnetate. These two tetrahedral anions have very similar sizes and potentials.



$$r(\text{Tc}-\text{O}) = 1.711(3) \text{ \AA}$$

$$\text{TcO}_4^-/\text{TcO}_2 E^\circ = 0.74 \text{ V}$$

$$K_a = 1.1 (\mu = 5)$$

$$\text{Sol. (K}^+, \text{H}_2\text{O, 25}^\circ\text{C)} = 0.11 \text{ molal}$$

$$r(\text{Re}-\text{O}) = 1.719(5) \text{ \AA}$$

$$\text{ReO}_4^-/\text{ReO}_2 E^\circ = 0.51 \text{ V}$$

$$K_a = 0.52 (\mu = 5)$$

$$\text{Sol. (K}^+, \text{H}_2\text{O, 25}^\circ\text{C)} = 0.11 \text{ molal}$$

Commercially available anion extractants, including Aliquat-336[®], will be used along with commercially available technical grade solvents, including *meta*-diisopropylbenzene. The concentrations of perrhenate in the aqueous phase will be chosen to simulate the concentrations of pertechnetate in known waste streams. As the work progresses, known co-contaminants will be added to the aqueous phase in an effort to closely simulate the composition of known waste streams. The exact nature of these results cannot be anticipated. The investigators will be in weekly communication with Drs. Kent Abney and Norman Schroeder as well as other LANL staff. In this way, the CSU investigators will learn about the evolving needs of the Hanford Waste Tank Remediation project, and therefore the lines of experimentation at Colorado State will drift in the direction of LANL and DOE programmatic needs.

The project will be broken down into the following distinct phases. **Phase 1.** Professor Strauss, the principal investigator, will complete an up-to-date literature search and review on solvent extraction methodologies (from both aqueous and non-aqueous media) for pertechnetate and perrhenate. The goal will be to identify promising anion extractants that might be tested, even if these are not commercially available. The P.I. will purchase and install the required equipment and supplies and will train the personnel (the graduate students and the postdoc). The team of investigators will complete an assessment of analytical techniques for the quantitative determination of sub-millimolar concentrations of ReO_4^- in both aqueous and non-aqueous media. The analytical techniques evaluated will include atomic absorption spectroscopy, inductively coupled plasma atomic emission spectroscopy, UV-VIS (electronic) spectrophotometry, and mass spectrometry. This phase of the project will be *completed* by the end of the first three months of the sub-contract.

Phase 2. The research team will complete a study of the extraction of ReO_4^- from acid solution and/or basic solution using Aliquat 336 as the anion extractant and *meta*-diisopropylbenzene as the non-aqueous solvent. The parameters chosen will parallel those used in a similar study of TcO_4^- extraction carried out by Dr. Norman Schroeder in INC-12. As the apparent necessity warrants and as time permits, this line of investigation will include the behavior of $[\text{OH}^-]$, $[\text{NO}_3^-]$, $[\text{NO}_2^-]$, $[\text{HCO}_3^-]$ with the chloride and nitrate forms of Aliquat-336. The quantitative data of interest are the values of the distribution coefficients (K_d) and the solubility of the anion extractant in the aqueous phase. These data will allow a determination to be made regarding the efficacy of perrhenate as a stable (non-radioactive) surrogate for pertechnetate as far as proven solvent extraction methodologies are concerned. This phase of the project will be *completed* by the end of the first six months.

Phase 3. The research team will begin a study of alternate non-aqueous solvents and alternate anion extractants. The emphasis will be on solvents that are not aromatic hydrocarbons, not chlorinated hydrocarbons, and that have flash points greater than 60°C. As far as anion extractants are concerned, some will be purchased from commercial sources, some will be supplied by scientists at LANL, and some will be synthesized in our laboratory. Our goal will be to improve the current extraction system involving Aliquat-336 and *meta*-diisopropylbenzene by at least a factor of 10 in K_d without sacrificing selectivity for TcO_4^- from other fission products and without creating a new waste stream that is environmentally problematic. Variables will include temperature, contact time, pH, $[NO_3^-]$, $[NO_2^-]$, and $[HCO_3^-]$. This phase of the project will be *started* before the end of the first nine months. It is open ended, since the number of new extraction systems is not limited, and for this reason this phase may not be "complete" by the end of the sub-contract.

Phase 4. The research team will begin a study of alternatives to re-extraction of ReO_4^- into aqueous acid for concentration, removal, and storage. The goal is to develop one or more methodologies that will allow ReO_4^- (and ultimately TcO_4^-) to be isolated in concentrated form directly from the non-aqueous solvent. This would eliminate the production of a high-volume waste stream (currently 8M nitric acid) and could conceivably lead to the recycling of the anion extractant. Several possible methods, including chemical precipitation, chemical reduction, and electrochemical reduction (with precipitation) will be explored. This phase of the project will be *started* before the end of the first twelve months and, if fruitful, could possibly become an ongoing project, since this is a *very* important aspect of the DOE's technetium waste problem.

The four phases of proposed experiments above are very ambitious. It is given as an indication of the direction that the research will take. It is anticipated that some of the activities will not be able to be explored as completely as others. Furthermore, as the project proceeds, and as the Strauss group communicates with the Los Alamos group, some of the proposed experiments might lose their urgency. However, the identification, evaluation, and development of alternative solvent extraction methodologies for perrhenate (pertechnetate) will remain the primary objective.

In addition to supplying the Strauss research group with new anion extractants, the INC-12 group at LANL will supply a Macintosh Centris 650 8/230 computer, including the latest versions of the software Word, Excel, Kalaidagraph, and Chemdraw Plus, that will be used for data collection, graphical analysis of data, literature searching (a modem pool exists via the chemistry department network), figure preparation, and report and manuscript preparation. This computer

will remain in Professor Strauss' lab at Colorado State University for the duration of the sub-contract. A printer is not required, since one is available to the Strauss group at CSU.

RESULTS

The exact nature of the results of the experiments outlined above cannot be anticipated. Hence, the expectations will be nothing more than the results of the experiments. The abilities and judgement of the investigators will be relied on to develop the most fruitful lines of experimentation.

DELIVERABLES

1. A report on Phase 1 of the project will be submitted to LANL by June 1, 1994.
2. A report on Phase 2 of the project will be submitted to LANL by July 1, 1994.
3. A report on Phase 3 of the project will be submitted to LANL by Sept. 1, 1994.
4. A final report on the project will be submitted to LANL by Sept. 30, 1994.

SECTION I — LITERATURE REVIEW

We have reviewed the literature related to this project, especially with respect to the extraction of TcO_4^- and ReO_4^- from aqueous solution using organic extractants and solvents. The database CAS Online was searched during July 1993 and April 1994. Our review appears in this Milestone as a 35-page appendix starting on page 16.

SECTION II — EQUIPMENT INSTALLATION AND PERSONNEL TRAINING

During the first phase of the project, major equipment, glassware, and supplies were purchased and installed in Professor Strauss' laboratory. The equipment included a Perkin-Elmer P-400 inductively-coupled-plasma atomic emission spectrometer (ICP-AES), a Büchi rotary evaporator, a Barnstead Nanopure water purifier, an Orion pH meter, a LabLine microprocessor shaker bath, a Macintosh Quadra 650 computer, and a vacuum system for the synthesis of new extractants.

The personnel who have worked on this project all have degrees in chemistry. They are:

- Professor Steven H. Strauss, P.I., Ph.D. 1979, Northwestern University
- Dr. M. Dawn Van Seggen, Ph.D. 1994, Colorado State University
- Ms. Carmen I. Butoi, A.B. 1993, Franklin and Marshall College
- Ms. Jennifer Clark, B.S. 1993, University of Colorado at Boulder
- Ms. Kristina M. Rohal, B.S. 1993, Bethany College
- Mr. Jeffrey J. Rack, B.S. 1990, Clemson University
- Mr. Tom Barbarich, B.S. 1991, Wayne State University
- Mr. Juston Rockwell, B.S. 1991, Fort Lewis College

SECTION III — QUANTITATIVE DETERMINATION OF ReO_4^-

During the summer of 1993 (before the contract began), Professor Strauss and Ms. Butoi evaluated several colorimetric (spectrophotometric) assays for ReO_4^- , most notably those involving simultaneous reduction of rhenium and complex formation with thiocyanate anion. The major references for these assays are given below:

- Wahi, A.; Kakkar, L. R. "Ascorbic acid as a new reductant in the thiocyanate method for the spectrophotometric determination of rhenium," *Fresenius J. Anal. Chem.* **1992**, *343*, 904
- Mishra, N.; Sinha, S. K.; Patel, K. S.; Mishra, R. K. "Extraction and Spectrophotometric Determination of Rhenium(VII) with Thiocyanate and Amides," *Bull. Chem. Soc. Japan* **1989**, *62*, 3400.
- Sharma, I.; Chakraborty, A. K. "Extraction and Spectrophotometric Determination of Rhenium with Thiocyanate and Hydroxamic Acids," *Indian J. Chem.* **1988**, *27A*, 271.
- Yatirajam, V.; Khaira, S.; Kakkar, L. R. "An Improved Thiocyanate Method for the Determination of Rhenium," *Indian J. Chem.* **1986**, *25A*, 879.
- Trop, H. S.; Davison, A.; Jones, A. G.; Davis, M. A.; Szalda, D. J.; Lippard, S. J. "Synthesis and Physical Properties of Hexakis(isothiocyanato)technetate(III) and -(IV) Complexes. Structure of the $[\text{Tc}(\text{NCS})_6]^{3-}$ Ion," *Inorg. Chem.* **1980**, *19*, 1105.
- Mitra, M.; Mitra, B. K. "Liquid-Liquid Extraction of a Rhenium-Thiocyanate Complex with Hexamethylphosphoramide and Direct Spectrophotometric Determination in the Organic Phase," *Talanta* **1978**, *25*, 597.
- Savariar, C. P.; Hariharan, T. R. "Solvent Extraction and Spectrophotometric Determination of Rhenium(VII) using Mixed Ligands," *J. Indian Chem. Soc.* **1978**, *55*, 349.
- Neas, R. E.; Guyon, J. C. "Spectrophotometric Determination of Thiocyanate with Rhenium," *Anal. Chem.* **1969**, *41*, 1470.
- Fujinaga, T.; Koyama, M.; Kanchiku, Y.; Tsurubo, S. "Solvent Extraction and Spectrophotometric Determination of the Pertechnetate Ion with Methyl Violet," *Bull. Chem. Soc. Japan* **1967**, *40*, 817.

We determined that none of the prescribed methods gave reproducible and precise results. All methods were flawed, primarily due to incomplete conversion of all of the rhenium present to a single species with a known extinction coefficient. No further attempts were made to improve the spectrophotometric procedures.

We evaluated atomic absorption (AA) spectroscopy as a technique to determine sub-millimolar concentrations of ReO_4^- . Rhenium cannot be determined using graphite furnace AA, which is normally one to two orders of magnitude more sensitive than standard AA, because it forms a refractory carbide. We prepared samples and traveled to the Perkin-Elmer facility in Denver, CO, where, with the help of a member of their technical staff, we determined that the lowest concentration of rhenium (in the form of ReO_4^-) that we could reproducibly and precisely measure was approx. 100 ppm (1 mM ReO_4^- = 1,800 ppm rhenium). Since we expect to develop superior extractants in the course of this project that could lead to residual concentrations of ReO_4^- below 1 ppm in the raffinate, we decided that AA spectroscopy was not suitable for this project.

We evaluated ICP-AES on another occasion, also with the help of the Perkin-Elmer technical staff. Reproducible and precise data were obtained for concentrations of rhenium (in the form of ReO_4^-) down to 0.25 ppm. On the basis of this evaluation, we purchased a used (one-year old) ICP atomic emission spectrometer from Perkin-Elmer in November 1993. Along with the two sections above, this completed Phase 1 of the project.

SECTION IV — EXTRACTION OF ReO_4^- USING ALIQUAT-336

During the next phase of the project, we studied the extraction of a 1.00 mM solution of KReO_4 in 5.00 M nitric acid using the commercial extractant Aliquat-336 nitrate (purchased from Aldrich Chemical Co.) dissolved in 1,3-diisopropylbenzene (DIPB; 96%, also purchased from Aldrich). The extractant is a viscous liquid. The sample purchased contained a small amount of a light colored precipitate. Solutions of the extractant in DIPB also contained a small amount of precipitate. Aldrich has informed us that they are discontinuing Aliquat-336 salts because of the formation of the precipitate, which they have not characterized. Another supplier will have to be found, and the formation of the precipitate remains a problem.

Standard samples of KReO_4 in 5.00 M nitric acid were prepared and were used to create ICP-AES calibration curves. Two such curves, created using freshly prepared perrhenate samples on two consecutive days, are shown on the next two pages (Figures 1-2). The agreement from day to day is more than adequate for the concentration range chosen (0-1 mM ReO_4^-). We have determined that standard samples of KReO_4 in nitric acid are stable for many weeks. Nevertheless, we plan to prepare fresh calibration standards on a regular basis.

[ReO4]- Calibration Curve, 5 M HNO3

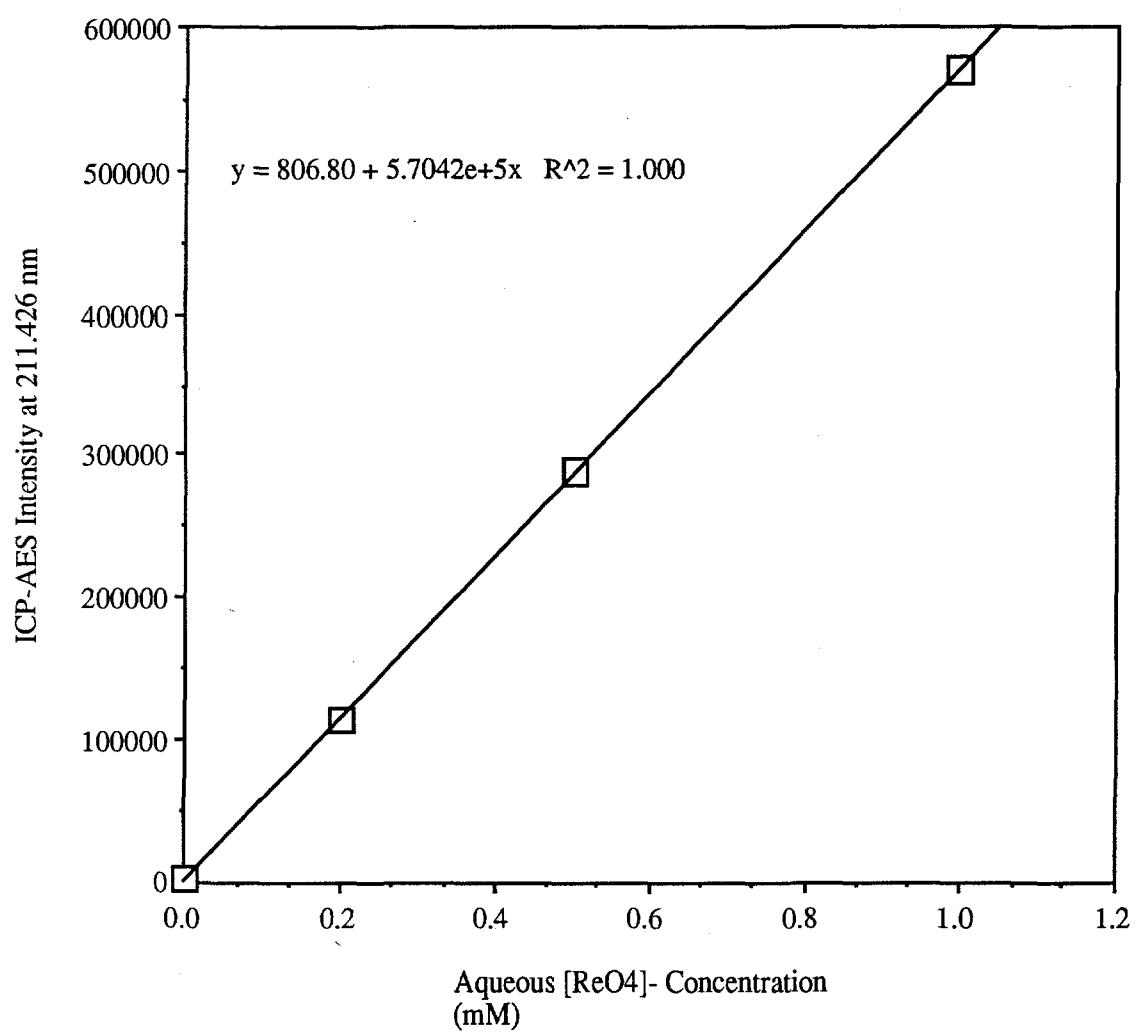


Figure 1. ICP Intensity vs. [ReO4⁻] (i.e., a calibration curve) for extraction of ReO4⁻ from aqueous 5M HNO₃ into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

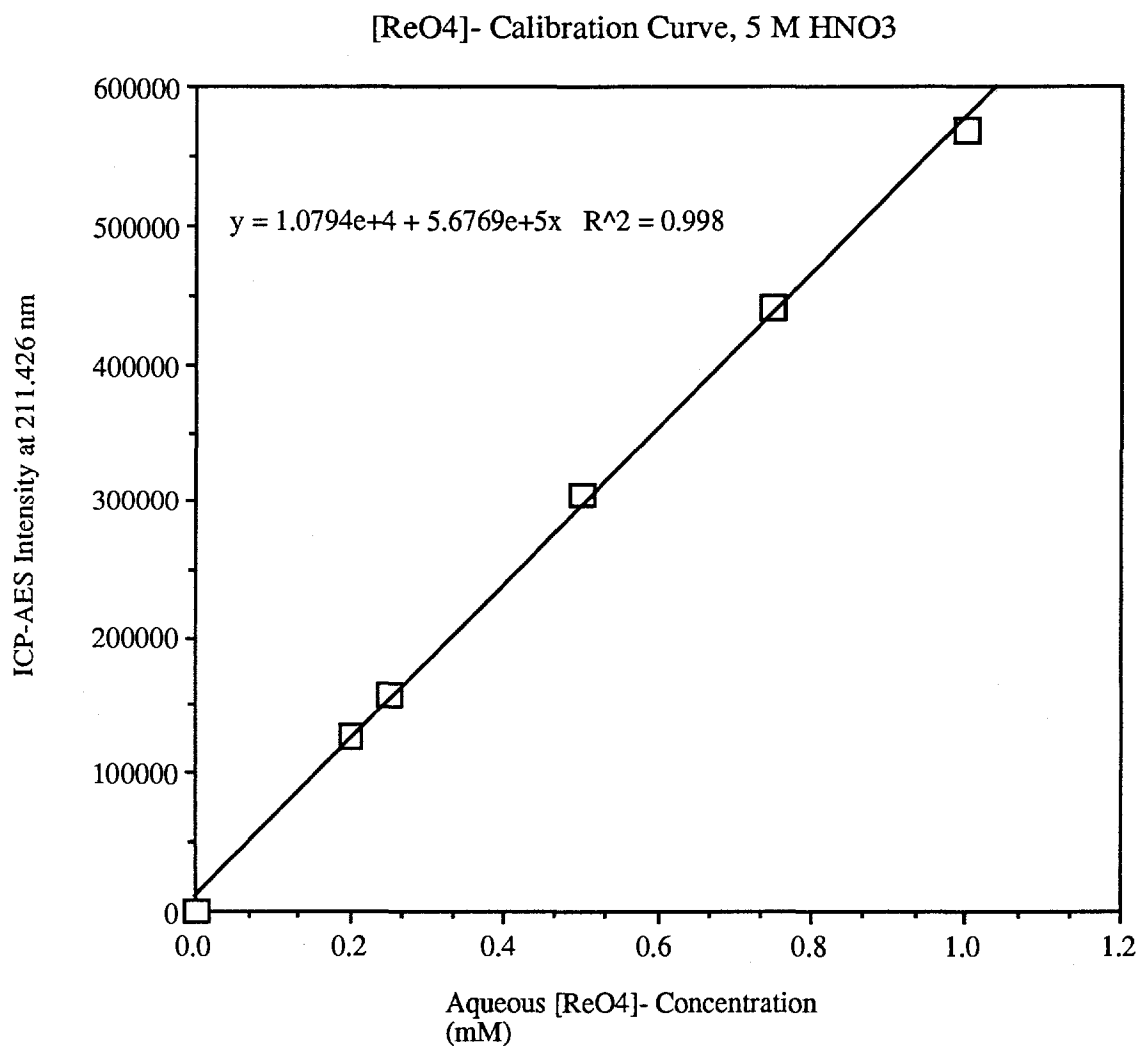


Figure 2. ICP Intensity vs. [ReO₄]⁻ (i.e., another calibration curve) for extraction of ReO₄⁻ from aqueous 5M HNO₃ into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

In a typical extraction experiment, 20 mL of aqueous perrhenate solution was mixed with 20 mL of an Aliquat-336 nitrate/DIPB solution and shaken for a prescribed amount of time at 20°C. The phases were separated using separatory funnels and the aqueous raffinate was collected in vials for immediate analysis on the ICP-AES. We found that a third phase was present in all experiments. The top phase was nearly colorless and is presumably mostly DIPB. The middle phase was yellow (neat Aliquat-336 nitrate is yellow), and is presumably a concentrated solution of the extractant in DIPB. The bottom phase was colorless and is presumably the aqueous raffinate. The volume of the middle phase increased as the concentration of extractant in DIPB increased from 0.100 M to 0.840 M. In a report that we received from Dr. Norm Schroeder last year, a plot of $\text{TcO}_4^- K_d$ vs. concentration of nitric acid showed that a third phase was present when the acid concentration was 7.5 M and 10.0 M but not at 5.0 M. We have not yet used 1-butanol as a modifier, to eliminate the third phase, in our experiments.

We found that the extractions were complete within 10 minutes: there was no difference in the residual concentration of ReO_4^- after 10, 20, 40, and 106 minutes of shaking at 20°C. Therefore, 20 minutes has been chosen for the shaking time in all subsequent experiments.

The distribution ratio (K_d) is defined as the concentration of ReO_4^- in the organic phase(s) (the extract) divided by the concentration of ReO_4^- remaining in the aqueous phase (the raffinate). Since we have directly determined only the latter concentration, K_d values were calculated as follows ($[\text{ReO}_4^-]_f$ is the final concentration of perrhenate remaining in the raffinate after the extraction is complete):

$$K_d = (1 - [\text{ReO}_4^-]_f) / [\text{ReO}_4^-]_f$$

For 0.200 M Aliquat-336 nitrate in DIPB, we found K_d to be 0.55 when the ratio of organic:aqueous volumes was 1:1 and 0.68 when the ratio of volumes was 2:1. In principal, the K_d values should not depend on the volumes chosen if the two phases are immiscible. Our values are lower than the K_d of ~1.8 for TcO_4^- measured under the same conditions by Dr. Norm Schroeder last year at LANL.

As expected, we found that K_d increased when the concentration of extractant was increased (for a constant ratio of volumes). The lowest K_d , 0.12, was measured when the

concentration of the extractant in DIPB was 0.100 M. The highest K_d , 4.0, was measured when the extractant concentration was 0.840 M. These data are displayed in two different ways in graphs shown below and on the next page (Figures 3-4).

[ReO₄]⁻ Conc. (final) vs. Aliquat-336 Conc.

5 M HNO₃, 1 mM initial [ReO₄]⁻

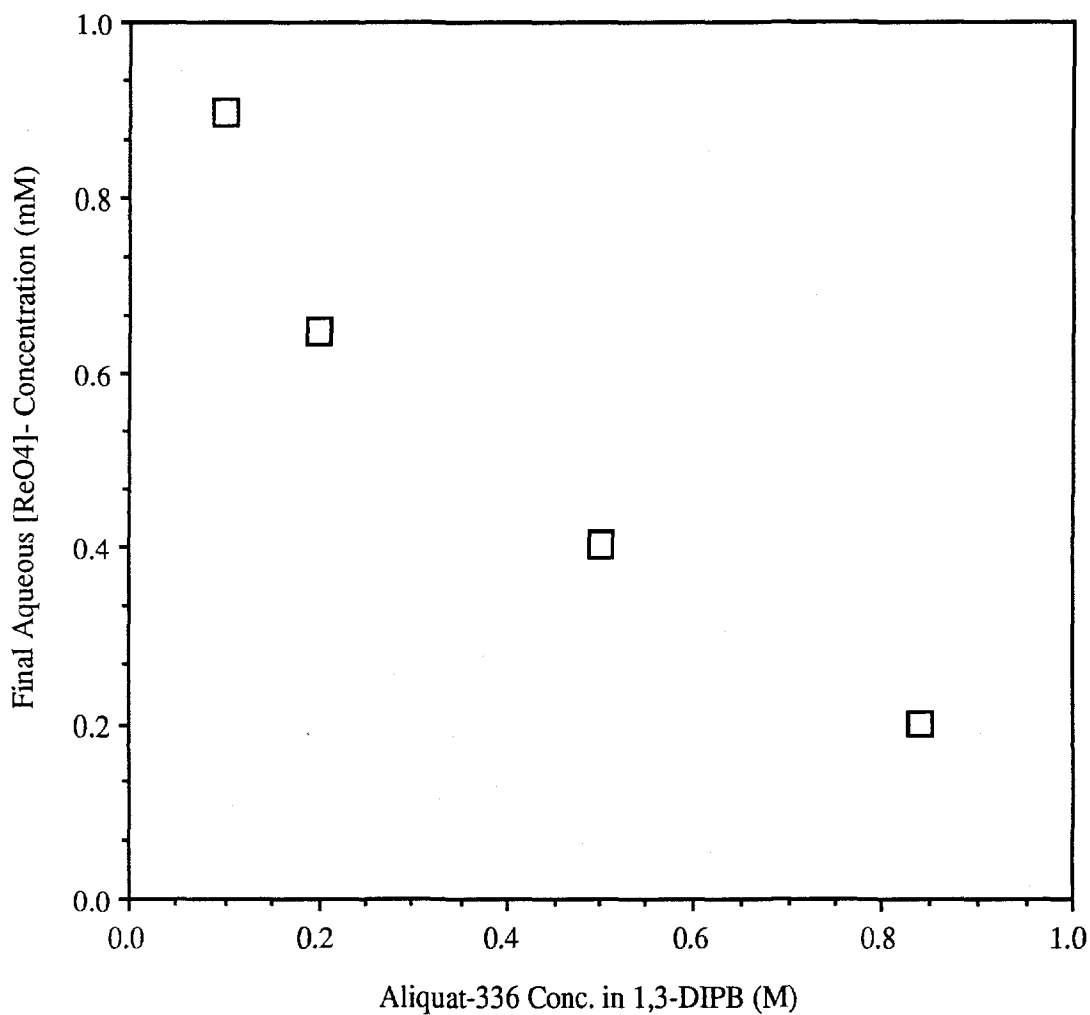


Figure 3. Final aqueous concentration of ReO₄⁻ vs. concentration of Aliquat-336.

[ReO₄]⁻ Dist. Ratio vs. Aliquat-336 Conc.

5 M HNO₃, 1 mM initial [ReO₄]⁻

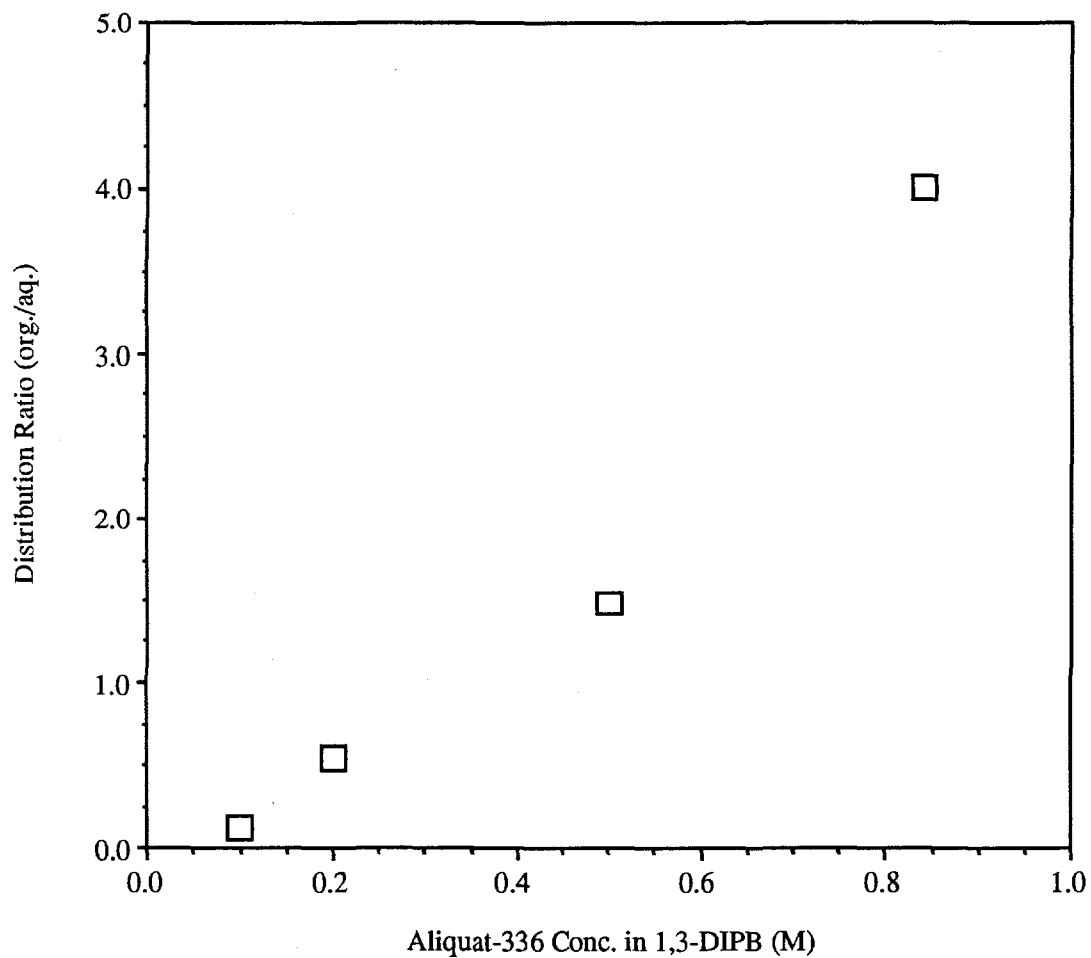


Figure 4. Distribution ratio ($K_d(\text{ReO}_4^-)$) vs. concentration of Aliquat-336.

SECTION V — FURTHER STUDIES ON THE EXTRACTION OF ReO_4^-

During phase one of this project, we determined that inductively-coupled-plasma atomic emission spectroscopy (ICP-AES) is the optimal technique for determining sub-millimolar concentrations of ReO_4^- in aqueous solution. We began our study of the extraction of ReO_4^- from nitric acid into 1,3-diisopropylbenzene containing 0.2 M of the commercial extractant Aliquat-336® nitrate (methyltricaprylammonium nitrate). During phase two of this project, we continued to study the extraction of ReO_4^- from various concentrations of nitric acid and from a number of other aqueous "waste stream simulants."

The following experimental procedure was used. Twenty mL of aqueous perrhenate solution (1.0, 5.0, or 10.0 mM KReO_4 , depending on the preliminary K_d value determined in screening experiments) was mixed with 20 mL of a 0.2 M Aliquat-336® nitrate (methyltricaprylammonium nitrate) solution in diisopropylbenzene (pure 1,3 isomer or technical grade, which contains 96% of the 1,3 isomer) and shaken for 20 min. at 20°C. The phases were separated using separatory funnels (10 min.) and the aqueous raffinate was collected in either glass or polyethylene vials for analysis on the ICP-AES (Perkin Elmer P400). The distribution ratio (K_d) is defined as the concentration of ReO_4^- in the organic phase(s) (the extract) divided by the concentration of ReO_4^- remaining in the aqueous phase (the raffinate). Since we have directly determined only the latter concentration, K_d values were calculated as follows ($[\text{ReO}_4^-]_i$ is the initial concentration of perrhenate in the aqueous layer and $[\text{ReO}_4^-]_f$ is the final concentration of perrhenate remaining in the aqueous layer (the raffinate) after the extraction is complete):

$$K_d = ([\text{ReO}_4^-]_i - [\text{ReO}_4^-]_f) / [\text{ReO}_4^-]_f$$

Our results are summarized in Table I, below. Some of the results are displayed graphically in Figures 5-7, below. The value of K_d drops by a factor of 29 between 0 M and 1 M HNO_3 and continues to drop by a factor of 100 between 1 M and 5 M HNO_3 (see Figure 1). This is undoubtedly due in large part to competition between ReO_4^- and NO_3^- for the extractant cation, methyltricaprylammonium ion, in the organic phase. The $\text{CH}_3\text{NR}_3^+/\text{ReO}_4^-$ ion pair in diisopropylbenzene is clearly more stable than the $\text{CH}_3\text{NR}_3^+/\text{NO}_3^-$ ion pair in this solvent. At 1 M aqueous HNO_3 and 1 mM aqueous KReO_4 , the starting aqueous concentration ratio $[\text{NO}_3^-]/[\text{ReO}_4^-]$ was 1,000 yet 98% of the perrhenate ion present was in the organic phase at the end of the extraction. At 5 M aqueous HNO_3 , only 35% of the perrhenate ions transferred from the aqueous phase to the organic phase.

The hydrogen ion concentration, $[\text{H}_3\text{O}^+]$, has a minor effect on K_d when the aqueous concentration of nitrate ion is kept constant at 3 M (see Figure 2). Increasing $[\text{H}_3\text{O}^+]$ from 10^{-7} M

Table I. Extraction of ReO_4^- from Aqueous Waste Stream Simulants^a

aqueous phase	K_d
18.3 Mohm water	1.4×10^3
1 M HNO_3	49
1 M HNO_3	28 ^b
2 M HNO_3	13
3 M HNO_3	4.3
4 M HNO_3	0.84
5 M HNO_3	0.55
2 M HNO_3 /1 M NaNO_3	6.1
1 M HNO_3 /2 M NaNO_3	11
3 M NaNO_3	27
0.5 M NaOH	2.8×10^3
1 M NaOH	3.1×10^3
2 M NaOH	3.4×10^3
3 M NaOH	4.3×10^3
4 M NaOH	4.5×10^3
5 M NaOH	6.1×10^3
1 M NaOH /1.5 M NaNO_3	87 ^c
1 M NaOH /1.5 M NaNO_3	29 ^b
1 M NaOH /1.5 M NaNO_2	3.3×10^2
1 M NaOH /1.5 M NaNO_3 /1.5 M NaNO_2	76

^a The organic phase was diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate unless otherwise noted. ^b The organic phase was 7.0% w/w 1-octanol in diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate. ^c To within experimental error, the same value ($K_d = 88$) was obtained when the Aliquat-336[®] solution was pretreated by shaking with 1 M NaOH for 24 h.

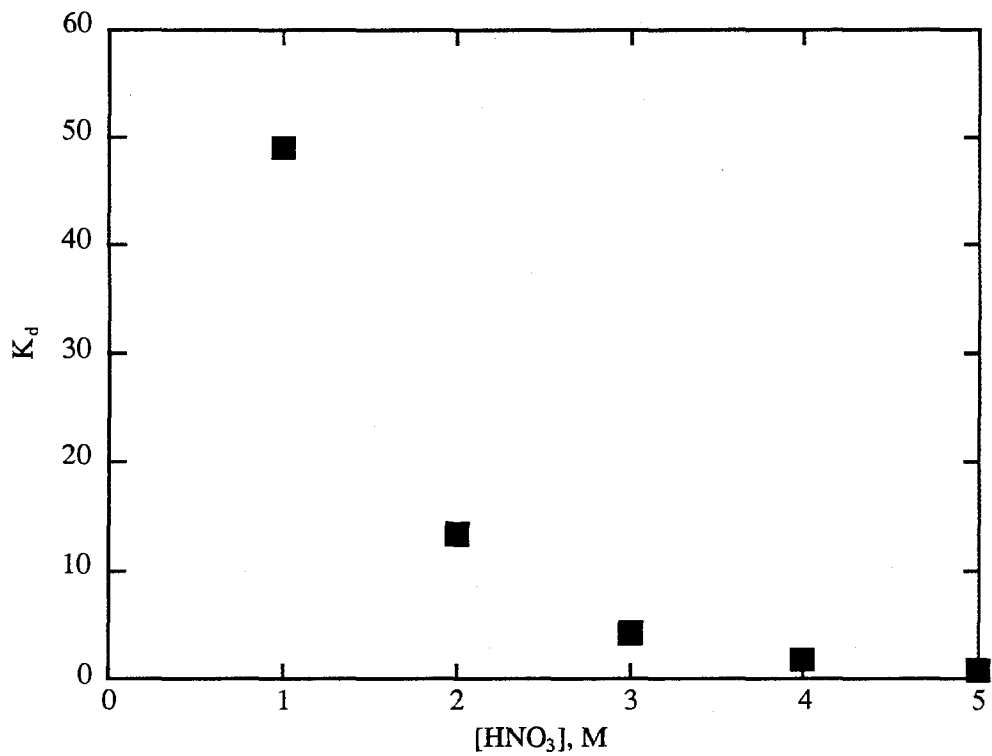
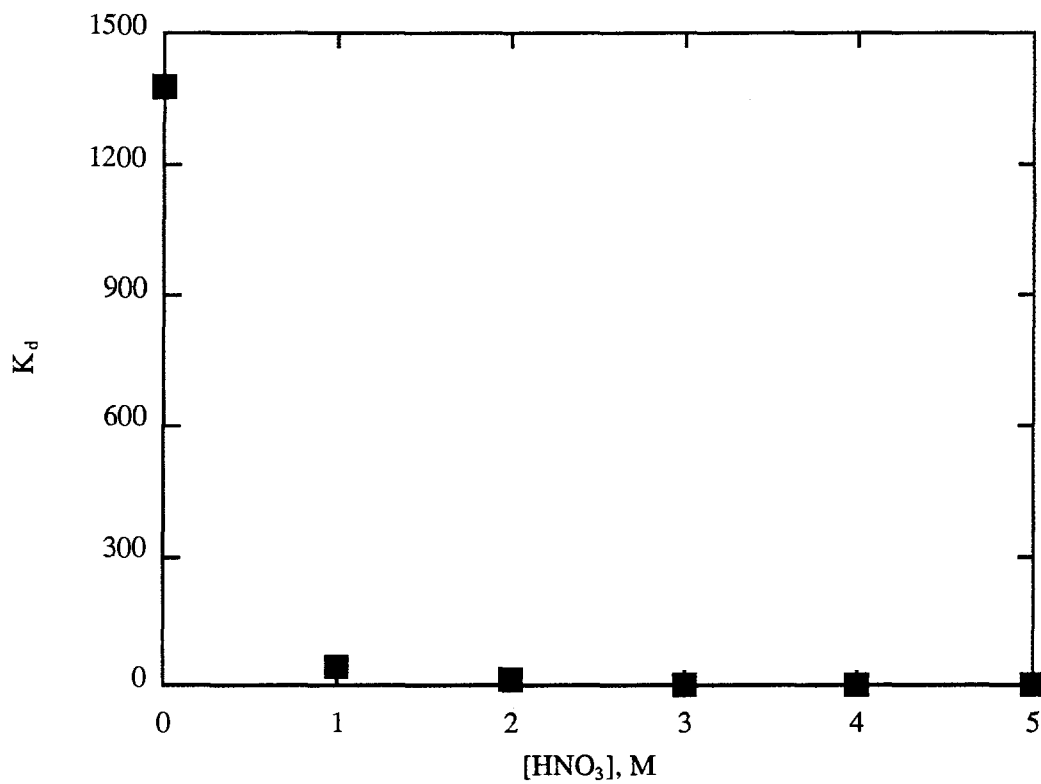


Figure 5. Plots of K_d vs. $[HNO_3]$, using two different ordinate scales, for extraction of ReO_4^- from aqueous HNO_3 into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

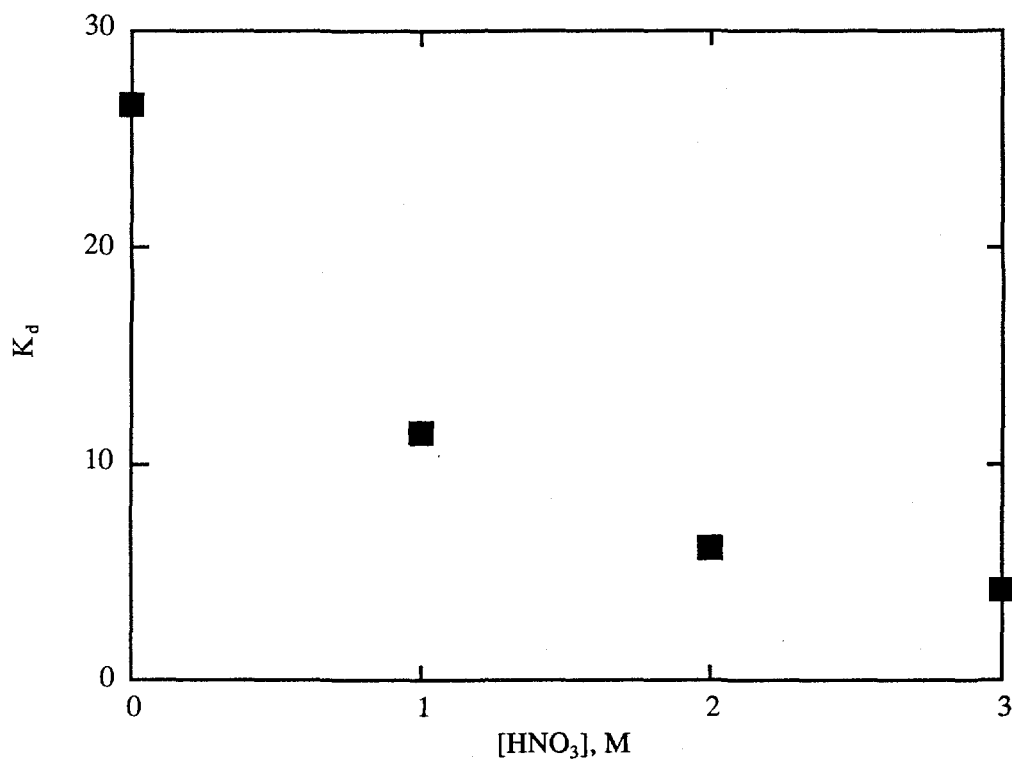


Figure 6. K_d vs. $[\text{HNO}_3]$ for extraction of ReO_4^- from aqueous mixtures of HNO_3 and NaNO_3 containing a constant 3 M concentration of NO_3^- into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

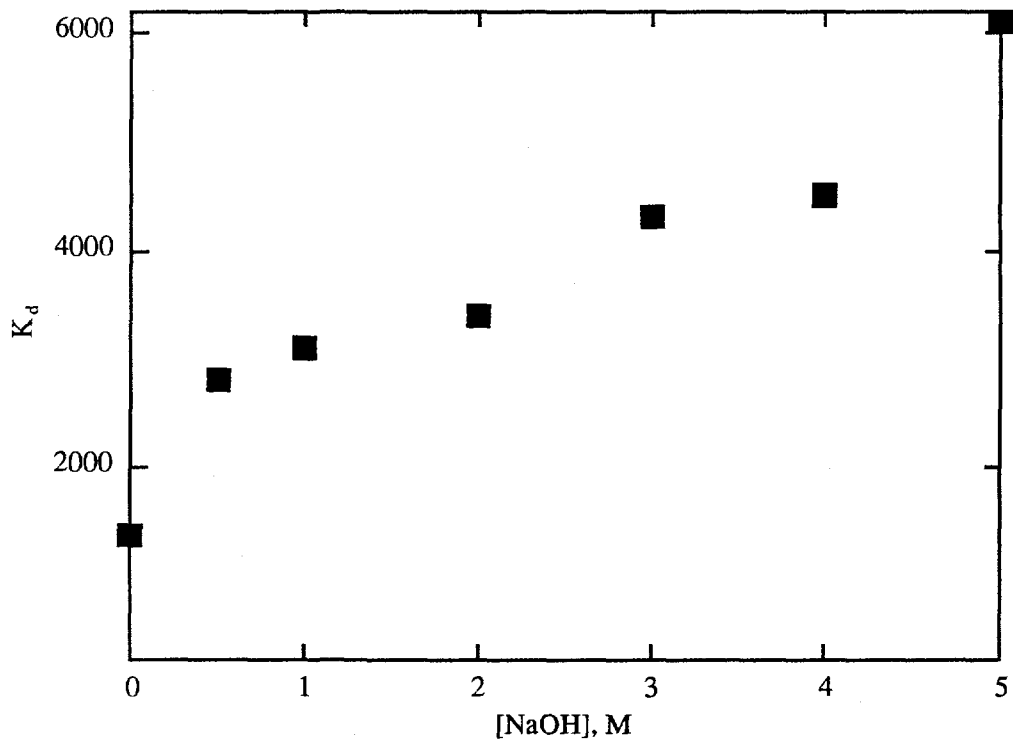


Figure 7. K_d vs. $[NaOH]$ for extraction of ReO_4^- from aqueous NaOH into diisopropylbenzene containing 0.2 M Aliquat-336 nitrate

(0 M HNO₃) to 3 M caused K_d to decrease from 27 to 4.3. This may be due to changes in the relative amounts of anionic ReO₄⁻ and neutral HReO₄ as [H₃O⁺] increases.¹

The value of K_d increases steadily as [OH⁻] increases (see Figure 7). A maximum value of K_d = 6.1 x 10³ was obtained when [OH⁻] = 5 M. However, the presence of nitrate ion decreased K_d dramatically. When the aqueous solution was simply 1 M NaOH, K_d was 2.8 x 10³. When 1.5 M NaNO₃ was also present, K_d was 87. When 1.5 M NaNO₂ was also present, the combination of OH⁻, NO₃⁻, and NO₂⁻ lowered K_d to 76. This last result indicates that nitrite ion does not affect K_d significantly when nitrate ion is already present. For an aqueous solution consisting of 1.0 M NaOH and 1.5 M NaNO₂, K_d was 3.3 x 10².

SECTION VI — EXTRACTION OF TcO₄⁻

Professor Strauss and Dr. Van Seggen spent two months in the CST-12 group at LANL (June and July, 1994). During this time, we studied the extraction of TcO₄⁻ from a variety of aqueous "waste stream simulants."

The following experimental procedure was used. A sample of either 2.5 or 3.0 mL of aqueous pertechnetate solution (1.5 x 10⁻⁵ M ⁹⁹TcO₄⁻, ~10⁻⁸ M ^{95m}TcO₄) was mixed in a thin glass tube with an equal volume of an organic phase containing 0.1 M or 0.2 M extractant and shaken for at least 2 min. at 20°C. The phases were separated by centrifugation (5 min. at 5,000 rpm) and either 1.0 or 1.5 mL of each phase was transferred to a thin plastic tube. The tubes were placed in a gamma ray counting instrument with a NaI(Tl) scintillation detection system (Packard Auto-Gamma[®] 5530). The number of counts-per-minute (CPM) for each sample and for several blanks (background, BKG) were recorded.

Technetium-95m (*I* = +1/2) decays with a half-life of 61 days by isomeric transition (4%), positron emission (0.4%) and electron capture with gamma emission (>95%).² Seventy percent of all decay events produce a gamma photon of energy 0.2042 MeV.² These are the photons that are counted (the lower and upper limits of photon energies counted by the instrument were set as 0.165 and 0.245 MeV, respectively).

The distribution ratio (K_d) is defined as the concentration of TcO₄⁻ in the organic phase (the extract) divided by the concentration of TcO₄⁻ remaining in the aqueous phase (the raffinate). K_d values were calculated as follows (the subscripts *o* and *a* refer to organic and aqueous phases, respectively):

$$K_d = (\text{CPM}_o - \text{BKG}) / (\text{CPM}_a - \text{BKG})$$

Our results are summarized in Table II, below. As the concentration of nitric acid in the aqueous phase increased from 1 M to 8 M, K_d decreased by a factor of 100, from 41 to 0.40. A comparison of Aliquat-336 nitrate with the new extractant DDP^+Cl^- (DDP^+ = 3,5-didodecylpyridinium ion) showed the Aliquat salt to be the better extractant in 7.0% w/w 1-octanol in diisopropylbenzene: K_d for 0.2 M Aliquat-336 nitrate was 41 while K_d for ~0.1 M DDP^+Cl^- was 4.9 (DDP^+Cl^- is not very soluble in 7.0% w/w 1-octanol in diisopropylbenzene). Therefore, for equal concentrations of these two extractants, the Aliquat salt would be approximately four times better than DDP^+Cl^- .

A series of extractions were carried out with an aqueous phase consisting of 1.0 M NaOH and 1.5 M $NaNO_3$. The baseline value of K_d for an organic phase consisting of diisopropylbenzene containing 0.2 M Aliquat-336 nitrate was 1.1×10^2 . (This value did not change when the contact (shake) time was changed from 2 minutes to 5 minutes to 24 hours.) When the organic diluent was changed to 7.0% 1-octanol in diisopropylbenzene, K_d decreased to 59. When an analog of 1-octanol, 2-ethyl-1-hexanol, was used as the diluent with 0.1 M Aliquat nitrate, K_d dropped to 4.0. Clearly, these alcohols must be avoided if high values of K_d are required. When 2,6-dimethyl-4-heptanone (diisobutylketone) was used as the diluent with 0.1 and 0.2 M Aliquat nitrate, K_d increased to 2.3×10^2 and 3.7×10^2 , respectively. This is a significant increase, and this solvent warrants further study (see Section IV, below). When neat 2,6-dimethyl-4-heptanone was used as the organic phase (no extractant added), K_d was 20. When the organic phase consisted of diisopropylbenzene containing ~0.1 M DPP^+Cl^- , K_d was less than 10^{-3} . Under these conditions, hydroxide ion is undoubtedly deprotonating the pyridinium ion, and the neutral pyridine does not function as an extractant for TcO_4^- .

A series of extractions were carried out with a varying aqueous phase. Each sample contained 1 M NaOH and all but one sample also contained other co-contaminants. The organic phase was 0.2 M Aliquat-336 nitrate in diisopropylbenzene in all cases. The baseline value of K_d when the aqueous phase was simply 1 M NaOH was 6.2×10^2 . When the aqueous phase also contained 1.5 M $NaNO_3$, K_d decreased to 1.1×10^2 . The presence of 0.14 M K_2CrO_4 in the 1 M NaOH/1.5 M $NaNO_3$ aqueous phase had a negligible effect on K_d . This concentration of chromate ion is ten times that present in Hanford tank 240-AN-106. Apparently, 0.2 M Aliquat-336 nitrate in diisopropylbenzene is not an effective extractant for divalent tetrahedral oxoanions. The presence of 1.5 M $NaNO_2$ in the 1 M NaOH/1.5 M $NaNO_3$ aqueous phase had a modest effect on K_d , lowering it to 96. When the aqueous phase consisted of a simulant of Hanford tank 240-AN-106 nominally containing 1 M NaOH, 1.5 M $NaNO_3$, 0.86 M $NaNO_2$, 0.49 M $NaAl(OH)_4$, 0.39 M Na_2CO_3 , 0.11 M Na_3PO_4 , 0.093 M NaCl, 0.073 M Na_3 (citrate), 0.031 M Na_2SO_4 , and 0.002 M $Ca(NO_3)_2$, the value of K_d was 1.5×10^2 (a small amount of solid was present when this simulant was prepared, so the concentrations of all reagents are listed as nominal).

Table II. Extraction of TcO₄⁻ from Aqueous Waste Stream Simulants^a

aqueous phase	K _d
1 M HNO ₃	41 ^b
1 M HNO ₃	4.9 ^c
8 M HNO ₃	0.40 ^b
1 M NaOH	6.2 x 10 ²
5 M NaOH	6.9 x 10 ²
1 M NaOH/1.5 M NaNO ₃	1.1 x 10 ² ^d
1 M NaOH/1.5 M NaNO ₃	59 ^b
1 M NaOH/1.5 M NaNO ₃	2.3 x 10 ² ^e
1 M NaOH/1.5 M NaNO ₃	3.7 x 10 ² ^f
1 M NaOH/1.5 M NaNO ₃	20 ^g
1 M NaOH/1.5 M NaNO ₃	4.0 ^h
1 M NaOH/1.5 M NaNO ₃	< 1 x 10 ⁻³ ^c
1 M NaOH/1.5 M NaNO ₃ /0.14 M K ₂ CrO ₄	1.0 x 10 ²
1 M NaOH/1.5 M NaNO ₂	2.4 x 10 ²
1 M NaOH/1.5 M NaNO ₃ /1.5 M NaNO ₂	96
DSS Simulant ([NaOH] = 0.783 M)	1.4 x 10 ²
DSS Simulant ([NaOH] = 1.0 M)	1.5 x 10 ²

^a The organic phase was diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate unless otherwise noted. ^b The organic phase was 7.0% w/w 1-octanol in diisopropylbenzene containing 0.2 M Aliquat-336[®] nitrate. ^c The organic phase was 7.0% w/w 1-octanol in diisopropylbenzene containing ~0.1M DDP⁺Cl⁻ (DDP⁺ = 3,5-didodecylpyridinium cation). ^d To within experimental error, the same value (K_d = 1.1 x 10²) was obtained whether the contact (shake) time was 2 min., 5 min., or 24 hours. ^e The organic phase was 2,6-dimethyl-4-heptanone (diisobutylketone) containing 0.1 M Aliquat-336[®] nitrate. ^f The organic phase was 2,6-dimethyl-4-heptanone containing 0.2 M Aliquat-336[®] nitrate. ^g The organic phase was neat 2,6-dimethyl-4-heptanone. ^h The organic phase was 2-ethyl-1-hexanol containing 0.1 M Aliquat-336[®] nitrate.

SECTION VII — POSSIBLE ALTERNATE SOLVENTS

After searching the literature and many chemical catalogs, we decided to focus our attention on the following solvents for use as diluents with Aliquat-336 nitrate and other alternative anion extractants. Volatility, flash point, and low solubility in water were of primary concern. Most, but not all, of these solvents were investigated in the third phase of this project.

Table III. Properties of Alternate Organic Solvents

	mol. formula	b.p. (°C)	F.p. (°C) ^a	density (g cm ⁻³)
2-ethyl-1-hexanol	C ₈ H ₁₈ O	183-186	77	0.833
2,6-dimethyl-4-heptanone	C ₉ H ₁₈ O	169	44	0.808
2-nonanone	C ₉ H ₁₈ O	192 ^b	64	0.832
3-nonanone	C ₉ H ₁₈ O	187-188	67	0.821
5-nonanone	C ₉ H ₁₈ O	186-187	60	0.826
3,3,5,5-tetramethylcyclohexanone	C ₁₀ H ₁₈ O	— ^c	73	0.881
dodecane	C ₁₂ H ₂₆	216	71	0.750
propylene carbonate	C ₄ H ₆ O ₃	240	132	1.189

^a Flash point. ^b At 743 Torr. ^c The boiling point of this compound is not available.

SECTION VIII — FURTHER STUDIES ON THE EXTRACTION OF ReO_4^-

During phase three of this project, we continued to study the extraction of ReO_4^- from nitric acid and from alkaline "waste stream simulants."

The following experimental procedure was used. Twenty mL of aqueous perrhenate solution (1.0, 5.0, or 10.0 mM KReO_4 , depending on the preliminary K_D value determined in screening experiments) was mixed with 20 mL of a 0.2 M Aliquat-336[®] nitrate (methyltricaprylammonium nitrate) solution in diisopropylbenzene (pure 1,3 isomer or technical grade, which contains 96% of the 1,3 isomer) and shaken for 20 min. at 25°C. The phases were separated using separatory funnels (~10 min.) and the aqueous raffinate was collected in either glass or polyethylene vials for analysis on the ICP-AES (Perkin Elmer P400). The distribution ratio (K_D) is defined as the concentration of ReO_4^- in the organic phase(s) (the extract) divided by the concentration of ReO_4^- remaining in the aqueous phase (the raffinate). Since we have directly determined only the latter concentration, K_D values were calculated as follows ($[\text{ReO}_4^-]_i$ is the initial concentration of perrhenate in the aqueous layer and $[\text{ReO}_4^-]_f$ is the final concentration of perrhenate remaining in the aqueous layer (the raffinate) after the extraction is complete):

$$K_D = ([\text{ReO}_4^-]_i - [\text{ReO}_4^-]_f) / [\text{ReO}_4^-]_f$$

Our results are summarized in Table IV, below. Our results clearly show that the aliphatic ketones 2-nonanone (flash point °C) and 3-nonanone (flash point °C) are superior to diisopropylbenzene as diluents. On the other hand, 2-ethyl-1-hexanol is clearly inferior to DIPB. No third phase was observed when the oxygenated solvents were used to extract ReO_4^- from 1 M HNO_3 .

Table IV. Extraction of ReO_4^- from Aqueous Waste Stream Simulants^a

aqueous phase	organic solvent	anion extractant	K_d
1 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	49 ^b
1 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	28 ^c
1 M HNO_3	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	56
1 M HNO_3	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	52
1 M HNO_3	EH	0.2 M Aliquat-336 ⁺ NO_3^-	5.5
1 M $\text{NaOH}/1.5$ M NaNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	87
1 M $\text{NaOH}/1.5$ M NaNO_3	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.6×10^2
1 M $\text{NaOH}/1.5$ M NaNO_3	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.8×10^2
1 M $\text{NaOH}/1.5$ M NaNO_3	EH	0.2 M Aliquat-336 ⁺ NO_3^-	5.1

^a Abbreviations: DIPB = diisopropylbenzene; 2-NON = 2-nonanone; 3-NON = 3-nonanone; TMCH = 3,3,5,5-tetramethylcyclohexanone; DMH = 2,6-dimethyl-4-heptanone; EH = 2-ethyl-1-hexanol; Aliquat-336⁺ = methyltricaprylammonium cation; DDP⁺ = 3,5-didodecylpyridinium cation; MDDP⁺ = 1-methyl-3,5-didodecylpyridinium cation. ^b A third layer formed in this experiment. ^c 7.0% w/w 1-octanol was added to the organic phase to avoid third layer formation.

SECTION IX — FURTHER STUDIES ON THE EXTRACTION OF TcO_4^-

During this project, Professor Strauss and Dr. Van Seggen spent two-months in the CST-12 group at LANL (June and July, 1994). During that time, we studied the extraction of TcO_4^- from a variety of aqueous "waste stream simulants."

The following experimental procedure was used. A sample of either 2.5 or 3.0 mL of aqueous pertechnetate solution (1.5×10^{-5} M $^{99}\text{TcO}_4^-$, $\sim 10^{-8}$ M $^{95\text{m}}\text{TcO}_4$) was mixed in a thin glass tube with an equal volume of an organic phase containing 0.1 M or 0.2 M extractant and shaken for at least 2 min. at 20°C. The phases were separated by centrifugation (5 min. at 5,000 rpm) and either 1.0 or 1.5 mL of each phase was transferred to a thin plastic tube. The tubes were placed in a gamma ray counting instrument with a NaI(Tl) scintillation detection system (Packard Auto-Gamma® 5530). The number of counts-per-minute (CPM) for each sample and for several blanks (background, BKG) were recorded.

Technetium-95m ($I = +1/2$) decays with a half-life of 61 days by isomeric transition (4%), positron emission (0.4%) and electron capture with gamma emission (>95%).² Seventy percent of all decay events produce a gamma photon of energy 0.2042 MeV.² These are the photons that are counted (the lower and upper limits of photon energies counted by the instrument were set as 0.165 and 0.245 MeV, respectively).

The distribution ratio (K_d) is defined as the concentration of TcO_4^- in the organic phase (the extract) divided by the concentration of TcO_4^- remaining in the aqueous phase (the raffinate). K_d values were calculated as follows (the subscripts *o* and *a* refer to organic and aqueous phases, respectively):

$$K_d = (\text{CPM}_o - \text{BKG}) / (\text{CPM}_a - \text{BKG})$$

Our results are summarized in Table V, below. Even allowing for differences in anion extractant concentration, 1-methyl-3,5-didodecylpyridinium iodide is not a more effective extractant than Aliquat-336 nitrate, in either acidic or alkaline waste stream simulants, when the common solvent diisopropylbenzene (DIPB) was used. The search for alternative extractants must continue.

Several ketone solvents gave significantly higher K_d values than DIPB when Aliquat-336 nitrate was used as the extractant. For example, when the aqueous phase was 1 M NaOH and 1.5 M NaNO_3 , 3-nonanone containing 0.2 M Aliquat-336 nitrate gave a K_d of 410 while DIPB containing 0.2 M Aliquat-336 nitrate gave a K_d of 110. Of the alternate solvents studied, only 2,6-dimethyl-4-heptanone (diisobutylketone) extracted TcO_4^- to any extent on its own (i.e., without an anion extractant like Aliquat-336 nitrate added).

Table V. Extraction of TcO₄⁻ from Aqueous Waste Stream Simulants^a

aqueous phase	organic solvent	anion extractant	K _d
1 M HNO ₃	DIPB	~0.1 M MDDP ⁺ I ⁻	3.6 ^b
1 M HNO ₃	DIPB	~0.1 M DDP ⁺ Cl ⁻	4.9 ^b
1 M HNO ₃	DIPB	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	41 ^b
1 M HNO ₃	2-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	1.4 x 10 ²
1 M HNO ₃	2-NON	0.1 M MDDP ⁺ I ⁻	43
1 M HNO ₃	3-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	1.4 x 10 ²
1 M HNO ₃	TMCH	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	2.1 x 10 ²
1 M HNO ₃	DMH	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	3.7 x 10 ²
1 M NaOH/1.5 M NaNO ₃	2-NON	0.1 M MDDP ⁺ I ⁻	63
1 M NaOH/1.5 M NaNO ₃	DIPB	~0.1 M MDDP ⁺ I ⁻	6.8
1 M NaOH/1.5 M NaNO ₃	DIPB	~0.1 M DDP ⁺ Cl ⁻	< 1 x 10 ⁻³
1 M NaOH/1.5 M NaNO ₃	DIPB	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	1.1 x 10 ²
1 M NaOH/1.5 M NaNO ₃	2-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	3.4 x 10 ²
1 M NaOH/1.5 M NaNO ₃	3-NON	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	4.1 x 10 ²
1 M NaOH/1.5 M NaNO ₃	TMCH	0.2 M Aliquat-336 ⁺ NO ₃ ⁻	5.7 x 10 ²
1 M NaOH/1.5 M NaNO ₃	EH	0.1 M Aliquat-336 ⁺ NO ₃ ⁻	4.0
1 M NaOH/1.5 M NaNO ₃	2-NON	none (neat solvent)	1.9 x 10 ⁻²
1 M NaOH/1.5 M NaNO ₃	3-NON	none (neat solvent)	4.4 x 10 ⁻³
1 M NaOH/1.5 M NaNO ₃	TMCH	none (neat solvent)	9.3 x 10 ⁻²
1 M NaOH/1.5 M NaNO ₃	DMH	none (neat solvent)	20

^a Abbreviations: DIPB = diisopropylbenzene; 2-NON = 2-nonanone; 3-NON = 3-nonanone; TMCH = 3,3,5,5-tetramethylcyclohexanone; DMH = 2,6-dimethyl-4-heptanone; EH = 2-ethyl-1-hexanol; Aliquat-336⁺ = methyltricaprylammonium cation; DDP⁺ = 3,5-didodecylpyridinium cation; MDDP⁺ = 1-methyl-3,5-didodecylpyridinium cation. ^b 7.0% w/w 1-octanol was added to the organic phase to avoid third layer formation.

SECTION III — COMPARISON OF TcO_4^- AND ReO_4^- EXTRACTIONS

Some of the data from Tables I, II, IV, and V have been combined in Table VI, below. These are direct comparisons of K_d values for TcO_4^- and ReO_4^- extractions under similar or identical conditions. The data conclusively demonstrate that perrhenate is a suitable nonradioactive surrogate for pertechnetate as far as solvent extraction technology is concerned.

Table VI. Comparison of TcO_4^- and ReO_4^- Extractions from Aqueous Waste Stream Simulants^a

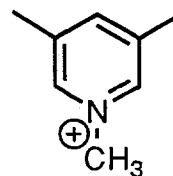
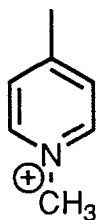
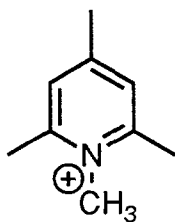
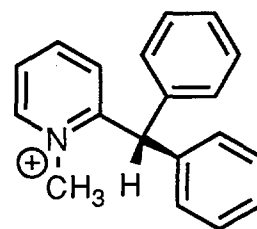
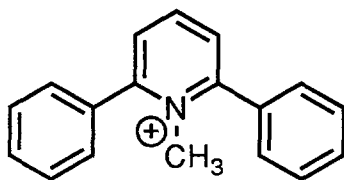
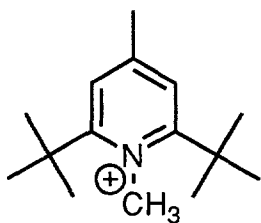
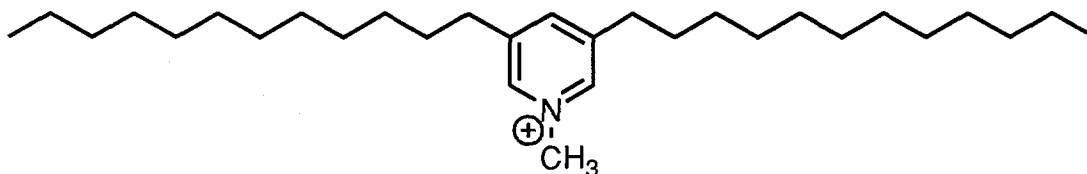
aqueous phase	organic solvent	anion extractant	K_d (TcO_4^-)	K_d (ReO_4^-)
1 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	41 ^b	28 ^b
1 M HNO_3	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.4×10^2	56
1 M HNO_3	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	1.4×10^2	52
8 M HNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	0.40 ^b	0.61 ^{b,c}
1 M NaOH	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	5.0×10^2	3.0×10^3
5 M NaOH	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	6.9×10^2	6.1×10^3
1 M $\text{NaOH}/1.5$ M NaNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	1.1×10^2	87
1 M $\text{NaOH}/1.5$ M NaNO_3	DIPB	0.2 M Aliquat-336 ⁺ NO_3^-	59 ^b	29 ^b
1 M $\text{NaOH}/1.5$ M NaNO_3	2-NON	0.2 M Aliquat-336 ⁺ NO_3^-	3.4×10^2	1.6×10^2
1 M $\text{NaOH}/1.5$ M NaNO_3	3-NON	0.2 M Aliquat-336 ⁺ NO_3^-	4.1×10^2	1.8×10^2

^a Abbreviations: DIPB = diisopropylbenzene; 2-NON = 2-nonanone; 3-NON = 3-nonanone; Aliquat-336⁺ = methyltricaprylammonium cation. ^b 7.0% w/w 1-octanol was added to the organic phase to avoid third layer formation. ^c The nitric acid concentration for this experiment was 7.6 M instead of 8 M.

SECTION XI — POSSIBLE ALTERNATE EXTRACTANTS

We have started to examine extractants other than Aliquat-336 nitrate. This line of experimentation is driven by the desire to discover an extractant more effective than, and less prone to radiolysis than, Aliquat-336 nitrate. The extractant 1-methyl-3,5-didodecylpyridinium iodide was obtained from Professor R. A. Bartsch at Texas Tech University (the cation is shown below). We have converted this extractant to the nitrate salt. ones we have obtained or prepare are shown in Figure 1, below. In addition, we have also prepared 1-methyl-4-(1-butylpentyl)pyridinium nitrate. Other *N*-methylpyridinium nitrates, shown below as their cations, have been prepared.

Unfortunately, all of the compounds except for 1-methyl-3,5-didodecylpyridinium iodide and 1-methyl-3,5-didodecylpyridinium nitrate are *too soluble in water* to function as anion extractants in this work. Only these two pyridinium salts, and their 1-trimethylsilylmethyl analogs, will be used for future work.



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APPENDIX

Literature Review

CAS Online Search, July 1993

Notes: 14333-24-5 is ReO_4^-
14333-20-1 is TcO_4^-

=> s 14333-24-5 and extract?
388 14333-24-5

85108 EXTRACT?
L2 47 14333-24-5 AND EXTRACT?

L2 ANSWER 1 OF 47
AN CA118(18):176907v
TI Correlation parameters for predicting
anion-exchange
extraction constants for 287
extraction systems
containing 236 different anions on an ES
computer with the program
OPAG2

AU Mezhov, E. A.; Reymarov, G. A.;
Khananishvili, N. L.; Schmidt, V. S.

LO Russia
SO Radiokhimiya, 34(1), 9-50
SC 68-2 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)

SX 20, 48, 54

DT J

CO RADKAU

IS 0033-8311

PY 1992

LA Russ

L2 ANSWER 2 OF 47
AN CA118(2):12320x
TI Studies on the ***extraction*** of
perrhenate by use of crown
ethers

AU Jewad, S. K.; Al-Murab, S. R.; Jalhoom, M.
G.

CS Coll. Educ., Univ. Baghdad

LO Baghdad, Iraq

SO Process Metall., 7A(Solvent Extr. 1990, Pt.
A), 907-11

SC 68-2 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)

SX 69

DT J

CO PMETEQ

PY 1992

LA Eng

L2 ANSWER 3 OF 47
AN CA116(20):206729s
TI ***Extraction*** and adsorption of chloro
complexes, perrhenate
(ReO_4^-), and tetrafluoroborate (BF_4^-) with
crown ethers and a crown
ether polymer

AU Onishi, Hiroshi; Koshima, Hideko

CS Dep. Chem., Univ. Tsukuba

LO Tsukuba 305, Japan

SO Anal. Sci., 7(Suppl., Proc. Int. Congr. Anal.
Sci., 1991, Pt. 1),

45-6

SC 79-0 (Inorganic Analytical Chemistry)

SX 68

DT J

CO ANSCEN

IS 0910-6340

PY 1991

LA Eng

L2 ANSWER 4 OF 47

AN CA115(22):246930m

TI ***Extraction*** spectrophotometric
study of the system of
tetrazolium violet-perrhenate-water-
chloroform. Determination of
rhenium in copper ore

AU Simeonova, Zh.; Aleksandrov, A.;
Stoimenov, N.

LO Bulg.

SO Nauchni Tr. - Plovdivski Univ., 27(5,
Khim.), 39-52

SC 79-6 (Inorganic Analytical Chemistry)

SX 68

DT J

CO NTPUB6

IS 0369-6227

PY 1989

LA Bulg

L2 ANSWER 5 OF 47

AN CA112(16):143191e

TI ***Extraction*** of the perrhenate anion
using goethite
surface-modified with hydrophobic
quaternary amines

AU Hudson, Michael J.; Tyler, Debra J.

CS Dep. Chem., Univ. Reading

LO Whiteknights/Reading RG6 2AD, UK

SO Hydrometallurgy, 24(1), 111-25

SC 54-2 (Extractive Metallurgy)

DT J

CO HYDRDA

IS 0304-386X

PY 1990

LA Eng

L2 ANSWER 6 OF 47

AN CA112(14):131212z

TI Anion ***extraction*** in the water-
inorganic salt-polar organic
solvent system

AU Shevchuk, I. A.; Makhno, A. Ya.

CS Donetsk. Gos. Univ.

LO Donetsk, USSR

SO Ukr. Khim. Zh. (Russ. Ed.), 55(4), 398-401

SC 79-1 (Inorganic Analytical Chemistry)

SX 68, 80

DT J

CO UKZHAU

IS 0041-6045

PY 1989

LA Russ

L2 ANSWER 7 OF 47
AN CA110(8):68683v
TI Effect of anions on direct potentiometric determination of potassium using ion-selective electrodes
AU Egorov, V. V.; Lushchik, Ya. F.; Starobinets, G. L.
CS NII Fiz.-Khim. Probl.
LO Minsk, USSR
SO Vestsi Akad. Navuk BSSR, Ser. Khim. Navuk, (3), 11-14
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO VBSKAK
IS 0002-3590
PY 1988
LA Russ

L2 ANSWER 8 OF 47
AN CA108(8):63457y
TI Studies on the ***extraction*** of rhenium(VII) with quaternary ammonium salt N263 and TOA [trioctylamine]
AU Gai, Huifa; Gao, Zili; Sun, Sixiu; Shen, Jinglan
CS Dep. Chem., Shandong Univ.
LO Jinan, Peop. Rep. China
SO Yingyong Huaxue, 4(5), 20-4
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
CO YIHUED
PY 1987
LA Ch

L2 ANSWER 9 OF 47
AN CA108(6):44665y
TI ***Extraction*** of rhenium by crystal violet
AU Gaibakyan, A. G.; Khachatryan, A. G.; Karapetyan, S. A.
CS Erevan State Univ.
LO USSR
SO Zh. Anal. Khim., 42(11), 2093-5
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
SX 79
DT J
CO ZAKHA8
IS 0044-4502
PY 1987
LA Russ

L2 ANSWER 10 OF 47
AN CA106(26):221140e
TI ***Extraction*** separation of rhenium by benzo-15-crown-5
AU Zhou, Zhixian; Yang, Junying
CS Dep. Chem., Zhengzhou Univ.
LO Zhengzhou, Peop. Rep. China
SO Huaxue Shiji, 9(1), 50-4
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)

DT J
CO HUSHDR
PY 1987
LA Ch

L2 ANSWER 11 OF 47
AN CA105(24):215336m
TI ***Extraction*** of tungsten and rhenium by basic or neutral ***extractants*** in xylene from mineral acidic media
AU Shabana, R.; Khalifa, S. M.; Abdalla, S.; Aly, H. F.
CS Nucl. Chem. Dep., At. Energy Establ.
LO Cairo, Egypt
SO J. Radioanal. Nucl. Chem., 106(1), 55-63
SC 71-6 (Nuclear Technology)
SX 68
DT J
CO JRNCMD
IS 0236-5731
PY 1986
LA Eng

L2 ANSWER 12 OF 47
AN CA105(22):198090g
TI Thermodynamic investigation of the system perrhenate-tetrazolium salt-water-chloroform
AU Alexandrov, A.; Simeonova, Zh.
CS Univ. Plovdiv
LO Plovdiv 4000, Bulg.
SO Thermochim. Acta, 107, 123-9
SC 69-2 (Thermodynamics, Thermochemistry, and Thermal Properties)
SX 68
DT J
CO THACAS
IS 0040-6031
PY 1986
LA Eng

L2 ANSWER 13 OF 47
AN CA103(4):28116m
TI Quantitative calculation of ***extraction*** equilibriums in an acridine dye-perrhenate-ion system
AU Gaibakyan, A. G.
LO USSR
SO Khimiya i Khim. Tekhnol., Erevan, (2), 57-63
From: Ref. Zh., Khim. 1985, Abstr. No. 8V207
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
PY 1983
LA Russ

L2 ANSWER 14 OF 47
AN CA101(12):98623g
TI Effect of solution ionic strength and temperature on the
extraction of perrhenate associates of tris(1,10-phenanthroline)iron(II)
AU Partman, A.; Udovenko, A. G.; Karmanova, E. G.; Belousov, E. A.
CS Leningr. Tekhnol. Inst.
LO Leningrad, USSR
SO Zh. Neorg. Khim., 29(7), 1879-81
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
CO ZNOKAQ
IS 0044-457X
PY 1984
LA Russ

L2 ANSWER 15 OF 47
AN CA97(8):61871j
TI Quantitative description using linear relationships of free energies for a new set of anion-exchange
extraction constants for a series of single-charged anions
AU Shmidt, V. S.; Rybakov, K. A.; Rubisov, V. N.
LO USSR
SO Zh. Neorg. Khim., 27(6), 1519-22
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
SX 66, 69
DT J
CO ZNOKAQ
IS 0044-457X
PY 1982
LA Russ

L2 ANSWER 16 OF 47
AN CA94(14):109976q
TI ***Extraction*** of rhenium(VII) by petroleum sulfoxides
AU Numanov, I. U.; Akhmadieva, R. G.; Yusupova, N. A.
CS Inst. Khim. im. Nikitina
LO Dushanbe, USSR
SO Dokl. Akad. Nauk Tadzh. SSR, 23(10), 582-5
SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
CO DANTAL
IS 0002-3469
PY 1980
LA Russ

L2 ANSWER 17 OF 47
AN CA93(16):156504y
TI ***Extraction*** of rhenium from sulfuric acid solutions using neutral ***extractants***
AU Adamova, A. Zh.; Ponomareva, E. I.

CS Inst. Metall. Obogashch.
LO Kazan, USSR
SO Kompleksn. Ispol'z. Miner. Syr'ya, (6), 75-7
SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
CO KIMSDD
PY 1980
LA Russ

L2 ANSWER 18 OF 47
AN CA91(20):163442p
TI ***Extraction*** chromatography of common anions in liquid-liquid anion exchange systems. Part. III. Monobasic aliphatic organic acids and their sodium salts as eluants
AU Przeszlakowski, S.; Kocjan, R.
CS Inst. Basic Chem. Sci., Med. Sch.
LO Lublin 20-081, Pol.
SO Chromatographia, 12(9), 587-94
SC 66-2 (Surface Chemistry and Colloids)
SX 79
DT J
CO CHRGB7
IS 0009-5893
PY 1979
LA Eng

L2 ANSWER 19 OF 47
AN CA91(12):97164w
TI Use of liquid ***extraction*** membranes for selective recovery of metals in electrochemical processes
AU Golubev, V. N.; Purins, B.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Teor. Osn. Khim. Tekhnol., 13(3), 440-1
SC 66-4 (Surface Chemistry and Colloids)
SX 68, 80
DT J
CO TOKTA8
IS 0040-3571
PY 1979
LA Russ

L2 ANSWER 20 OF 47
AN CA91(10):79612m
TI ***Extraction*** of elements as oxygen anions from alkaline solutions. IV. ***Extraction*** of rhenium(VII) with tributyl phosphate
AU Dakar, G. M.; Iofa, B. Z.; Nesmeyanov, A. N.
LO USSR
SO Radiokhimiya, 21(3), 409-12
SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
CO RADKAU
IS 0033-8311 PY 1979 LA Russ

L2 ANSWER 21 OF 47
AN CA89(22):186470u
TI Effect of a microcomponent on electrochemical and ***extraction*** properties of a liquid membrane in a macrocomponent solution
AU Golubev, V. N.; Purins, B.; Filatova, T. A.; Nikolaev, N. I.; Chuvileva, G. G.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Tezisy Dokl. - Vses. Konf. Ekstr., Volume 3, 6-8. Edited by: Purin, B. A. "Zinatne": Riga, USSR.
SC 66-4 (Surface Chemistry and Colloids)
DT C
CO 39BPAK
PY 1977
LA Russ

L2 ANSWER 22 OF 47
AN CA89(22):186392v
TI Study of the principles of ion transfer through liquid ***extraction*** membranes. II. Selectivity of ion transfer
AU Golubev, V. N.; Purins, B.; Filatova, T. A.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (4), 456-8
SC 66-2 (Surface Chemistry and Colloids)
DT J
CO LZAKAM
IS 0002-3248
PY 1978
LA Russ

L2 ANSWER 23 OF 47
AN CA89(12):95730n
TI Time of equilibrium attainment in solvent ***extraction*** of halide complexes of metals with basic dyes
AU Kish, P. P.; Balog, I. S.
CS Uzhgorod State Univ.
LO Uzhgorod, USSR
SO Zh. Anal. Khim., 33(5), 871-7
SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
CO ZAKHA8
IS 0044-4502
PY 1978
LA Russ

L2 ANSWER 24 OF 47
AN CA88(24):177835u
TI Organotin compounds as ***extractants*** . ***Extraction*** of oxygen-containing anions by dialkyltin dinitrates
AU Spivakov, B. Ya.; Shkinev, V. M.; Zolotov, Yu. A.

CS Inst. Geokhim. Anal. Khim. im. Vernadskogo
LO Moscow, USSR
SO Org. Reagenty Anal. Khim., Tezisy Dokl. Vses. Konf., 4th, Volume 2, 110-11. Edited by: Pilipenko, A. T. "Naukova Dumka": Kiev, USSR.
SC 68-1 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT C
CO 35THAO
PY 1976
LA Russ

L2 ANSWER 25 OF 47
AN CA88(12):79495p
TI ***Extraction*** chromatography of common anions in liquid-liquid anion exchange systems. I. Strong monobasic acids and their sodium salts as eluants
AU Przeszlakowski, S.; Kocjan, R.
CS Inst. Basic Chem. Sci., Med. Sch.
LO Lublin, Pol.
SO Chromatographia, 10(7), 358-63
SC 66-2 (Surface Chemistry and Colloids)
SX 79
DT J
CO CHRGB7
PY 1977
LA Eng

L2 ANSWER 26 OF 47
AN CA87(4):29486v
TI Effect of current pulse imposition on electrochemical transfer of ions through liquid ***extraction*** membranes
AU Golubev, V. N.; Purins, B.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (2), 155-7
SC 66-4 (Surface Chemistry and Colloids)
SX 76
DT J
CO LZAKAM
PY 1977
LA Russ

L2 ANSWER 27 OF 47
AN CA87(4):29225j
TI Study of the characteristics of ion transfer through liquid ***extraction*** membranes. I. Diffusion transfer of ions
AU Golubev, V. N.; Purins, B.; Filatova, T. A.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser., (2), 158-60
SC 65-1 (General Physical Chemistry)
DT J
CO LZAKAM PY 1977 LA Russ

L2 ANSWER 28 OF 47
AN CA86(16):111664q
TI Features of the ***extraction*** of the
perrhenate ion with
basic acridine orange dye
AU Tarayan, V. M.; Mirzoyan, F. V.;
Sarkisyan, Zh. V.
CS Erevan. Gos. Univ.
LO Yerevan, USSR
SO Dokl. Akad. Nauk Arm. SSR, 63(1), 36-41
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 79
DT J
CO DANAAW
PY 1976
LA Russ

L2 ANSWER 29 OF 47
AN CA85(18):136816h
TI Study of liquid-liquid ***extraction*** of
perrhenate with
cyclohexanone in different media
AU Jordanov, N.; Pavlova, M.; Bojkova, D.
CS Inst. Gen. Inorg. Chem.
LO Sofia, Bulg.
SO Talanta, 23(6), 463-5
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO TLNTA2
PY 1976
LA Eng

L2 ANSWER 30 OF 47
AN CA84(16):112395y
TI On the characteristics of ***extraction***
of the perrhenate ion
with the basic dye victoria blue 4R
AU Tarayan, V. M.; Mirzoyan, F. V.;
Sarkisyan, Zh. V.
CS Erevan. Gos. Univ.
LO Yerevan, USSR
SO Arm. Khim. Zh., 28(12), 992-7
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO AYKZAN
PY 1975
LA Russ

L2 ANSWER 31 OF 47
AN CA83(22):184233w
TI ***Extraction*** of astraphloxin salts
AU Borisova, I. A.; Sergievskii, V. V.
LO USSR
SO Tr. Khim. Khim. Tekhnol., (3), 145-6
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 79
DT J
CO TKKTAE
PY 1974
LA Russ

L2 ANSWER 32 OF 47
AN CA83(18):153285k
TI Mechanism of solvent ***extraction*** of
perrhenate ions by
cyclohexanone
AU Jordanov, N.; Pavlova, M.; Boikova, D.
CS Inst. Gen. Inorg. Chem.
LO Sofia, Bulg.
SO Proc. Int. Solvent Extr. Conf., Volume 3,
2263-8. Edited by:
Jeffreys, G. V. Soc. Chem. Ind.: London, Engl.
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT C
CO 30XIAE
PY 1974
LA Eng

L2 ANSWER 33 OF 47
AN CA83(14):121456a
TI ***Extraction*** of perrhenate ion by the
basic dye methyl green
AU Tarayan, V. M.; Mirzoyan, F. V.;
Sarkisyan, Zh. V.
CS Erevan. Gos. Univ.
LO Yerevan, USSR
SO Arm. Khim. Zh., 27(10), 825-31
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 79
DT J
CO AYKZAN
PY 1974
LA Russ

L2 ANSWER 34 OF 47
AN CA83(10):87311n
TI Conductivity of model ***extraction***
membranes in the presence
of thiooxine and several of its derivatives
AU Golubev, V. N.; Purins, B.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser.,
(1), 40-3
SC 72-12 (Electrochemistry)
SX 76
DT J
CO LZAKAM
PY 1975
LA Russ

L2 ANSWER 35 OF 47
AN CA81(26):177772b
TI Electrochemical transfer of some anions
through liquid
extraction membrane (trioctylamine-
amyl alcohol)
AU Golubev, V. N.; Purins, B.; Filatova, T. A.
CS Inst. Inorg. Chem.
LO Riga, USSR
SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser.,
(4), 450-3
SC 68-4 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 66
DT J
CO LZAKAM
PY 1974
LA Russ

L2 ANSWER 36 OF 47
AN CA81(26):176557y
TI Electrochemical transfer of perrhenate ions
through the
extraction membranes
AU Golubev, V. N.; Purins, B.; Filatova, T. A.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser.,
(3), 259-61
SC 66-2 (Surface Chemistry and Colloids)
DT J
CO LZAKAM
PY 1974
LA Russ

L2 ANSWER 37 OF 47
AN CA81(26):176554v
TI Ionic selectivity of model ***extraction***
membranes
AU Golubev, V. N.; Purins, B.
CS Inst. Neorg. Khim.
LO Riga, USSR
SO Novosti Elektrokhim. Org. Soedin., Tezisy
Dokl. Vses. Soveshch.
Elektrokhim. Org. Soedin., 8th, Meeting
Date 1973, 121. Edited by:
Feoktistov, L. G. "Zinatne": Riga, USSR.
SC 66-2 (Surface Chemistry and Colloids)
DT C
CO 28TSAX
PY 1973
LA Russ

L2 ANSWER 38 OF 47
AN CA81(24):159863c
TI Indirect evaluation of the selectivity of
liquid ***extraction***
membranes
AU Golubev, V. N.; Purins, B.
CS Inst. Inorg. Chem.
LO Riga, USSR
SO Latv. PSR Zinat. Akad. Vestis, Kim. Ser.,
(4), 443-6

SC 68-2 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 66
DT J
CO LZAKAM
PY 1974
LA Russ

L2 ANSWER 39 OF 47
AN CA81(6):30248b
TI Solvent ***extraction*** from molten
salts. X.
Extraction of perrhenate by
alkylammonium salts
AU David-Auslaender, J.; Zangen, M.; Kertes,
A. S.
CS Dep. Inorg. Phys. Chem., Soreq Nucl. Res.
Cent.
LO Yavne, Israel
SO J. Inorg. Nucl. Chem., 36(2), 425-30
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO JINCAO
PY 1974
LA Eng

L2 ANSWER 40 OF 47
AN CA80(4):20030q
TI Possibility of ***extraction*** of
rhenium(VII) with some
carbonyl group-containing organic compounds
AU Kalcheva, V.; Angelova, V.; Doicheva,
R.; Simov, D.
CS Sofia Univ.
LO Sofia, Bulg.
SO God. Sofii. Univ., Khim. Fak., Volume
Date 1969-1970, 64, 21-31
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO GSKFAL
PY 1972
LA Bulg

L2 ANSWER 41 OF 47
AN CA77(10):66698e
TI ***Extraction*** of some anions from
molten lithium
nitrate-potassium nitrate by
tetraoctylphosphonium nitrate in
polyphenyl or 1-nitronaphthalene solvent
AU Tan, Zoilo C. H.; Irvine, J. W., Jr.
CS Dep. Chem., Massachusetts Inst. Technol.
LO Cambridge, Mass., USA
SO Inorg. Chem., 11(7), 1701-7
SC 68-1 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
DT J
CO INOCAJ
PY 1972
LA Eng

L2 ANSWER 42 OF 47
AN CA76(18):107600s
TI Analytical properties of the indicator Nile Blue. II.

Extraction -photometric determination of some anions with the blue form of Nile Blue

AU Savic, M.; Savic, J.
CS Inst. Chem., Fac. Sci.
LO Sarajevo, Yugoslavia
SO Glas. Hem. Tehnol. Bosne Hercegovine, No. 17, 5-11
SC 79 (Inorganic Analytical Chemistry)
DT J
CO GHTBAB
PY 1969
LA Fr

L2 ANSWER 43 OF 47
AN CA75(4):26041n
TI Equilibriums in perrhenate ion-bis-(4-methylbenzylaminophenyl)antipyrilcarbinol-organic solvent ***extraction*** systems

AU Busev, A. I.; Dzintarnieks, M.; Rudzitis, G.; Ogareva, M. B.
CS M. V. Lomonosov Moscow State Univ.
LO Moscow, USSR
SO Zh. Anal. Khim., 26(3), 521-31
SC 68 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
DT J
CO ZAKHA8
PY 1971
LA Russ

L2 ANSWER 44 OF 47
AN CA69(18):70572m
TI Organic oxides as ***extractants*** for metal anions

AU Krasovec, F.; Klofutar, C.
CS Inst. "Jozef Stefan"
LO Ljubjana, Yugoslavia
SO Solvent Extr. Chem., Proc. Int. Conf., Goteborg, Volume Date 1966
509-16

SC 68 (Phase Equilibriums, Chemical Equilibriums, and Solutions)

DT J
CO 19CVAL
PY 1967
LA Eng

L2 ANSWER 45 OF 47
AN CA69(18):70548h
TI Solvent ***extraction*** of some anions from molten $\text{NH}_4\text{NO}_3 \cdot 2\text{H}_2\text{O}$

with tetraheptylammonium nitrate
AU Nikolic, R. M.; Gal, I. J.
CS Boris Kidric Inst. Nucl. Sci.
LO Belgrade, Yugoslavia
SO J. Inorg. Nucl. Chem., 30(7), 1963-9
SC 68 (Phase Equilibriums, Chemical Equilibriums, and Solutions)

DT J
CO JINCAO
PY 1968
LA Eng

L2 ANSWER 46 OF 47
AN CA67(16):76688j
TI Properties of anions controlling the ***extractability*** of

their associates with triarylmethane dyes
AU Lomonosov, S. A.; Nikolaev, A. V.
CS Ural'sk. Nauch.-Issled. Khim. Inst.
LO Sverdlovsk, USSR
SO Zh. Strukt. Khim., 8(2), 216-20
SC 68 (Phase Equilibriums, Chemical Equilibriums, and Solutions)

DT J
CO ZSTKAI
PY 1967
LA Russ

L2 ANSWER 47 OF 47
AN CA67(12):57672h
TI Ion exchange ***extraction*** of rhenium from alkaline solution

AU Lebedev, K. B.; Ageev, S. A.
SO Izv. Akad. Nauk Kaz. SSR, Ser. Khim., 17(2), 5-11
SC 68 (Phase Equilibriums, Chemical Equilibriums, and Solutions)

DT J
CO IKAKAK
PY 1967
LA Russ

=> s rhenium and spectrophotometric
14660 RHENIUM
36745 SPECTROPHOTOMETRIC

L3 189 RHENIUM AND
SPECTROPHOTOMETRIC

=> s l3 and quantitative
39519 QUANTITATIVE

L4 1 L3 AND QUANTITATIVE

=> d l4

L4 ANSWER 1 OF 1
AN CA78(12):79308y
TI Morpholinium morpholine-N-dithiocarbamate as a reagent in ***quantitative*** analysis. IX.

Spectrophotometric determination of ***rhenium***

AU Likussar, W.; Beyer, W.
CS Inst. Anorg. Anal. Chem., Univ. Graz
LO Graz, Austria
SO Mikrochim. Acta, (2), 211-17
SC 79-6 (Inorganic Analytical Chemistry)

DT J
CO MIACAQ
PY 1973
LA Ger

=> s l3 and thiocyanate
14139 THIOCYANATE
L5 19 L3 AND THIOCYANATE

=> d l5 1-19

L5 ANSWER 1 OF 19
AN CA117(22):225311m
TI Ascorbic acid as a new reductant in the
thiocyanate method
for the ***spectrophotometric***
determination of
rhenium

AU Wahi, Anu; Kakkar, L. R.
CS Dep. Chem., Kurukshetra Univ.
LO Kurukshetra 132119, India
SO Fresenius' J. Anal. Chem., 343(12), 904-5
SC 79-2 (Inorganic Analytical Chemistry)
SX 73
DT J
CO FJACES
IS 0937-0633
PY 1992
LA Eng

L5 ANSWER 2 OF 19
AN CA113(16):144420m
TI Extraction- ***spectrophotometric***
determination of molybdenum,
tungsten and ***rhenium*** with
thiocyanate and
thioacetanilide

AU Mishra, N.; Ghosh, A.; Mishra, R. K.;
Patel, K. S.
CS Dep. Chem., Ravishankar Univ.
LO Raipur 492010, India
SO Anal. Sci., 6(3), 407-10
SC 79-6 (Inorganic Analytical Chemistry)
SX 61
DT J
CO ANSCEN
IS 0910-6340
PY 1990
LA Eng

L5 ANSWER 3 OF 19
AN CA112(18):171217m
TI Extraction and ***spectrophotometric***
determination of

rhenium (VII) with
thiocyanate and amides
AU Mishra, Neera; Sinha, S. K.; Patel, K. S.;
Mishra, R. K.
CS Dep. Chem., Ravishankar Univ.
LO Raipur 492010, India
SO Bull. Chem. Soc. Jpn., 62(10), 3400-2
SC 79-6 (Inorganic Analytical Chemistry)

DT J
CO BCSJA8
IS 0009-2673
PY 1989
LA Eng

L5 ANSWER 4 OF 19

AN CA109(6):47486x
TI Extraction and ***spectrophotometric***
determination of
rhenium with ***thiocyanate***
and hydroxamic acids

AU Sharma, Indrani; Chakraborty, A. K.
CS Dep. Chem., Jadavpur Univ.
LO Calcutta 700 032, India
SO Indian J. Chem., Sect. A, 27A(3), 271-3
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO IJCADU
IS 0376-4710
PY 1988
LA Eng

L5 ANSWER 5 OF 19
AN CA108(8):67959m
TI ***Spectrophotometric*** determination
of chloride in
platinum-alumina/silica catalysts with
mercuric ***thiocyanate***
-iron(3+) reagent

AU Koshy, V. J.; Garg, V. N.
CS Res. Cent., Indian Petrochem. Corp. Ltd.
LO Baroda 391 346, India
SO Talanta, 34(11), 905-8
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO TLNTA2
IS 0039-9140
PY 1987
LA Eng

L5 ANSWER 6 OF 19
AN CA107(22):211154u
TI Ion-association complex of ***rhenium***
(IV)- ***thiocyanate***

with metoclopramide hydrochloride
AU Ramappa, P. G.; Ramachandra, K. S.
CS Dep. Chem.
LO Mysore 570006, India
SO J. Inst. Chem. (India), 59(2), 115
SC 79-6 (Inorganic Analytical Chemistry)

DT J
CO JOICA7
IS 0020-3254
PY 1987
LA Eng

L5 ANSWER 7 OF 19
AN CA105(26):237503r
TI An improved ***thiocyanate*** method
for the determination of
rhenium

AU Yatirajam, V.; Khaira, Sirpal; Kakkar, L.
R.
CS Dep. Chem., Kurukshetra Univ.
LO Kurukshetra 132 119, India
SO Indian J. Chem., Sect. A, 25A(9), 879-81
SC 79-2 (Inorganic Analytical Chemistry)
DT J
CO IJCADU
IS 0376-4710 PY 1986 LA Eng

L5 ANSWER 8 OF 19
AN CA98(16):136793s
TI Solvent extraction and
spectrophotometric determination of
rhenium using ***thiocyanate***
and chlorpromazine
AU Ramappa, P. G.; Gowda, H. Sanke;
Manjappa, S.
CS Dep. Post-Grad. Stud. Res. Chem., Univ.
Mysore
LO Mysore 570 006, India
SO J. Inst. Chem. (India), 54(6), 271-2
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO JOICA7
IS 0020-3254
PY 1982
LA Eng

L5 ANSWER 9 OF 19
AN CA97(14):119669t
TI Improvement of the extraction-
spectrophotometric
thiocyanate method for the
determination of ***rhenium***
by addition of imipramine
AU Nayak, Anant N.; Manjappa, S.;
Ramappa, P. G.; Yathirajan, H. S.
CS Dep. Chem., Govt. Coll. Boys
LO Mandya 571 401, India
SO Fresenius' Z. Anal. Chem., 309(5), 396
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO ZACFAU
IS 0016-1152
PY 1981
LA Eng

L5 ANSWER 10 OF 19
AN CA92(12):103664y
TI Direct extraction of complex
thiocyanate anions with a
chloroform solution of a cation-active tenside
AU Malat, M.
CS Dep. Anal. Chem., Charles Univ.
LO Prague CS-12840/2, Czech.
SO Fresenius' Z. Anal. Chem., 297(5), 417
SC 79-4 (Inorganic Analytical Chemistry)
DT J
CO ZACFAU
IS 0016-1152
PY 1979
LA Eng

L5 ANSWER 11 OF 19
AN CA90(20):161611y
TI Liquid-liquid extraction of a
rhenium - ***thiocyanate***
complex with hexamethylphosphoramide
and direct
spectrophotometric determination in
the organic phase
AU Mitra, Monidipa; Mitra, B. K.
CS Dep. Chem., Jadavpur Univ.

LO Calcutta, India
SO Talanta, 25(10), 597-9
SC 79-6 (Inorganic Analytical Chemistry)
SX 73
DT J
CO TLNTA2
IS 0039-9140
PY 1978
LA Eng

L5 ANSWER 12 OF 19
AN CA89(16):139893z
TI Solvent extraction and
spectrophotometric determination of
rhenium (VII) using mixed ligands
AU Savariar, C. P.; Hariharan, T. R.
CS Dep. Chem., Univ. Calicut
LO Calicut, India
SO J. Indian Chem. Soc., 55(4), 349-51
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO JICSAH
IS 0019-4522
PY 1978
LA Eng

L5 ANSWER 13 OF 19
AN CA86(12):83217a
TI Improvement of some procedures for
photometric determination of
rhenium
AU Stefanov, S.; Jordanov, N.; Pavlova, M.
CS Inst. Gen. Inorg. Chem.
LO Sofia, Bulg.
SO Mikrochim. Acta, 2(5-6), 449-53
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO MIACAQ
PY 1976
LA Ger

L5 ANSWER 14 OF 19
AN CA83(14):125670p
TI Extraction- ***spectrophotometric***
method for the determination
of ***rhenium*** using mixed ligands
AU Savariar, C. P.; Hariharan, T. R.
CS Dep. Chem., Univ. Calicut
LO Calicut, India
SO Mikrochim. Acta, (5-6), 477-83
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO MIACAQ
PY 1975
LA Eng

L5 ANSWER 15 OF 19
AN CA77(10):69772k
TI Determination of ***rhenium*** by a
thiocyanate method
in the absence of an extractant
AU Ermolaev, M. I.; Gukova, Yu. Ya.;
Kuznetsova, N. A.
LO USSR
SO Tr. Voronezh. Tekhnol. Inst., No. 18, 74-5
From: Ref. Zh., Khim. 1971, Abstr. No.
15G116
SC 79-6 (Inorganic Analytical Chemistry)
DT J
PY 1970
LA Russ

L5 ANSWER 16 OF 19
AN CA71(20):98060h
TI ***Spectrophotometric*** determination
of ***thiocyanate***
with ***rhenium***
AU Neas, Robert E.; Guyon, John C.
CS Univ. of Missouri
LO Columbus, Mo., USA
SO Anal. Chem., 41(11), 1470-3
SC 79 (Inorganic Analytical Chemistry)
DT J
CO ANCHAM
PY 1969
LA Eng

L5 ANSWER 17 OF 19
AN CA70(14):63978r
TI ***Spectrophotometric*** determination
of trace amounts of
rhenium
AU Basinska, Maria; Rutkowski, Wladyslaw
CS Inst. Badan Jadrowych
LO Warsaw, Poland
SO Chem. Anal. (Warsaw), 13(4), 799-807
SC 79 (Inorganic Analytical Chemistry)
DT J
CO CANWAJ
PY 1968
LA Pol

L5 ANSWER 18 OF 19
AN CA69(4):15875n
TI The ***thiocyanate*** method for the
photometric determination
of ***rhenium***
AU Iordanov, N.; Pavlova, M.
CS Bulgarian Acad. Sci.
LO Sofia, Bulg.
SO Proc. Conf. Appl. Phys.-Chem. Methods
Chem. Anal., Budapest, 3, 81-9
SC 79 (Inorganic Analytical Chemistry)
DT J
CO 19SWA2
PY 1966
LA Eng

L5 ANSWER 19 OF 19
AN CA66(16):72181v

TI Analytical studies of ***rhenium*** III.
Spectrophotometric determination of
rhenium with
thiocyanate and anion exchange
separation of molybdenum and
rhenium
AU Kojima, Masuo; Okubo, Teiji
SO Tokyo Kogyo Shikensho Hokoku, 61(9),
372-7
SC 79 (Inorganic Analytical Chemistry)
DT J
CO TKSHAI
PY 1966
LA Japan

=> s rhenium and recovery
14660 RHENIUM
97670 RECOVERY
L6 325 RHENIUM AND RECOVERY

=> s 16 and 14333-24-5
388 14333-24-5
L7 7 L6 AND 14333-24-5

=> d 17 1-7

L7 ANSWER 1 OF 7
AN CA110(16):138169h
TI Elution of ***rhenium*** from anion
exchangers
AU Pfrepper, Gerd
CS Akademie der Wissenschaften der DDR
LO Ger. Dem. Rep.
SO Ger. (East), 3 pp.
PI DD 260227 A1 21 Sep 1988
AI DD 87-302368 4 May 1987
IC ICM B01D015-04
SC 49-9 (Industrial Inorganic Chemicals)
DT P
CO GEXXA8
PY 1988
LA Ger

L7 ANSWER 2 OF 7
AN CA109(4):25697q
TI ***Recovery*** of ***rhenium*** from
sulfate solutions
containing zinc
AU Balakin, S. M.; Khudyakov, I. F.;
Rychkov, V. N.
CS Ural. Politekh. Inst.
LO Sverdlovsk, USSR
SO Kompleksn. Ispol'z. Miner. Syr'ya, (2), 29-
33
SC 54-2 (Extractive Metallurgy)
DT J
CO KIMSDD
PY 1988
LA Russ

L7 ANSWER 3 OF 7
AN CA102(10):81046u
TI ***Recovery*** of ***rhenium*** salts
from aqueous solutions
of perrhenates
AU Petrovich, V. A.; Tabulina, L. V.;
Arzhanov, S. I.
CS MRTI
LO USSR
SO Khim. Khim. Tekhnol. (Minsk), 19, 47-9
SC 49-5 (Industrial Inorganic Chemicals)
SX 54
DT J
CO KKTEDK
PY 1984
LA Russ

L7 ANSWER 4 OF 7
AN CA99(18):142455v
TI ***Recovery*** of perrhenate compounds
from aqueous solutions
AU Gerisch, Siegfried
CS VEB Mansfeld-Kombinat "Wilhelm
Pieck"; Forschungsinstitut fuer
NE-Metalle
LO Ger. Dem. Rep.
SO Ger. (East), 16 pp.
PI DD 200566 Z 18 May 1983
AI DD 81-232734 24 Aug 1981
IC C01G047-00
SC 49-5 (Industrial Inorganic Chemicals)
SX 54
DT P
CO GEXXA8
PY 1983
LA Ger

L7 ANSWER 5 OF 7
AN CA91(24):201201u
TI Redox potential-pH diagram of the
rhenium -sulfur-water
system
AU Kanimov, K. K.; Ogorodnikov, Yu. I.
CS Inst. Metall. Obogashch.
LO Alma-Ata, USSR
SO Deposited Doc., VINITI 2913-78, 14 pp.
Avail. VINITI
SC 72-12 (Electrochemistry)
SX 54, 69
DT T
PY 1978
LA Russ

L7 ANSWER 6 OF 7
AN CA73(22):113294z
TI Use of acidified urea solutions as a
rhenium desorbent
AU Suvorovskaya, N. A.; Shikhova, V. V.;
Shmarinova, I. A.; Karavaeva,
S. D.
LO USSR
SO Nauch. Soobshch., Inst. Gorn. Dela,
Moscow, 47, 39-41
From: Ref. Zh., Khim. 1970 Abstr. No. 2G112

SC 66 (Surface Chemistry and Colloids)
DT J
CO NSIGBO
PY 1969
LA Russ

L7 ANSWER 7 OF 7
AN CA72(22):114073t
TI Flotation of anions with the aid of cationic
surfactants. II.
Flotation of perrhenates
AU Charewicz, Witold; Niemiec, Jan
CS Polytech.
LO Wroclaw, Poland
SO Nukleonika, 14(6), 607-17
SC 54 (Extractive Metallurgy)
DT J
CO NUKLAS
PY 1969
LA Eng

=> s rhenium and redox(w)potentials
14660 RHENIUM
33790 REDOX
18448 POTENTIALS
910 REDOX(W)POTENTIALS

L8 15 RHENIUM AND
REDOX(W)POTENTIALS

=> d l8 1-15

L8 ANSWER 1 OF 15
AN CA118(18):178762t
TI Electron-transfer behavior of
oxorhenium(V), nitridorhenium(V) and
rhenium (III)
diethyldithiocarbamate complexes
AU Holder, Grant N.; Kanning, Mark W.
CS Dep. Chem., Appalachian State Univ.
LO Boone, NC 28608, USA
SO Inorg. Chim. Acta, 197(1), 67-73
SC 72-2 (Electrochemistry)
SX 66, 78
DT J
CO ICHAA3
IS 0020-1693
PY 1992
LA Eng

L8 ANSWER 2 OF 15
AN CA118(16):159836d
TI Coordination compounds of
pentaaminerhenium(III/II)
AU Orth, Stephen D.; Barrera, Joseph; Sabat,
Michal; Harman, W. Dean
CS Dep. Chem., Univ. Virginia
LO Charlottesville, VA 22901, USA
SO Inorg. Chem., 32(5), 594-601
SC 78-7 (Inorganic Chemicals and Reactions)
SX 68, 75
DT J
CO INOCAJ
IS 0020-1669
PY 1993 LA Eng OS CJACS

L8 ANSWER 3 OF 15
AN CA118(16):159807v
TI Complexes of 3-hydroxypyridin-2-one and 1,2-dimethyl-3-hydroxypyridin-4-one with second and third row elements of groups 6, 7 and 8
AU Griffith, William P.; Mostafa, Sahar I.
CS Dep. Chem., Imp. Coll. Sci. Technol. Med. LO London SW7 2AY, UK
SO Polyhedron, 11(23), 2997-3005
SC 78-7 (Inorganic Chemicals and Reactions)
DT J
CO PLYHDE
IS 0277-5387
PY 1992
LA Eng

L8 ANSWER 4 OF 15
AN CA118(8):72400h
TI Luminescence and intramolecular energy-transfer processes in isomeric cyano-bridged ***rhenium*** (I)-***rhenium*** (I) and ***rhenium*** (I)-ruthenium(II)-***rhenium*** (I) polypyridyl complexes
AU Kalyanasundaram, K.; Graetzel, M.; Nazeeruddin, M. K.
CS Inst. Chim. Phys., Ec. Polytech. Fed. LO Lausanne CH-1015, Switz.
SO Inorg. Chem., 31(25), 5243-53
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72, 73
DT J
CO INOCAJ
IS 0020-1669
PY 1992
LA Eng
OS CJACS

L8 ANSWER 5 OF 15
AN CA113(14):125259z
TI Ligand-bridged homo- and hetero-binuclear carbonyl polypyridyl complexes of ***rhenium*** (I): syntheses, electronic spectra, redox, and luminescence behavior
AU Kalyanasundaram, Kuppaswamy; Nazeeruddin, Mohammad K.
CS Inst. Chim. Phys., Ec. Polytech. Fed. Lausanne
LO Lausanne CH-1015, Switz.
SO J. Chem. Soc., Dalton Trans., (5), 1657-62
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72, 73
DT J
CO JCDTBI
IS 0300-9246
PY 1990
LA Eng
OS CJRSC

L8 ANSWER 6 OF 15

AN CA112(26):244838b
TI Stabilization of biochemical relevant intermediates by metal coordination. IV. ***Rhenium*** (I) complexes of flavin- and pterin-analogous nitrogen-oxygen chelate ligands
AU Bessenbacher, Christian; Kaim, Wolfgang
CS Inst. Anorg. Chem., Univ. Stuttgart
LO Stuttgart D-7000/80, Fed. Rep. Ger.
SO Z. Anorg. Allg. Chem., 577, 39-52
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72, 73
DT J
CO ZAACAB
IS 0044-2313
PY 1989
LA Ger

L8 ANSWER 7 OF 15
AN CA112(14):127586g
TI Electrochemical parametrization of metal complex ***redox*** potentials***, using the ruthenium(III)/ruthenium(II) couple to generate a ligand electrochemical series
AU Lever, A. B. P.
CS Dep. Chem., York Univ.
LO North York, ON M3J 1P3, Can.
SO Inorg. Chem., 29(6), 1271-85
SC 72-2 (Electrochemistry)
SX 29, 78
DT J
CO INOCAJ
IS 0020-1669
PY 1990
LA Eng
OS CJACS

L8 ANSWER 8 OF 15
AN CA111(8):69802r
TI Stability range of heterometal cubane-type clusters MFe₃S₄: assembly of double-cubane clusters with the ***rhenium***-iron-sulfur [[ReFe₃S₄]] core
AU Ciarli, Stefano; Carney, Michael J.; Holm, R. H.; Papaefthymiou, G.
C.
CS Dep. Chem., Harvard Univ.
LO Cambridge, MA 02138, USA
SO Inorg. Chem., 28(14), 2696-8
SC 78-7 (Inorganic Chemicals and Reactions)
SX 75
DT J
CO INOCAJ
IS 0020-1669
PY 1989
LA Eng
OS CJACS

L8 ANSWER 9 OF 15
AN CA110(18):164966k
TI Synthesis, optical, photophysical, and redox properties of a ligand-bridged heteronuclear
(OC)5W(pyz)Re(CO)4Cl (pyz = pyrazine) complex
AU Zulu, Mthembeni M.; Lees, Alistair J.
CS Dep. Chem., State Univ. New York
LO Binghamton, NY 13901, USA
SO Organometallics, 8(4), 955-60
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72, 73, 74
DT J
CO ORGND7
IS 0276-7333
PY 1989
LA Eng
OS CJACS

L8 ANSWER 10 OF 15
AN CA108(13):112170k
TI Polybipyridine ligands derived from acyclic and macrocyclic polyamines; synthesis and metal-binding studies
AU Lehn, Jean Marie; Ziessel, Raymond
CS Inst. Le Bel, Univ. Louis Pasteur
LO Strasbourg F-67000, Fr.
SO J. Chem. Soc., Chem. Commun., (17), 1292-4
SC 27-16 (Heterocyclic Compounds (One Hetero Atom))
SX 78
DT J
CO JCCCAT
IS 0022-4936
PY 1987
LA Eng
OS CASREACT 108:112170; CJRSC

L8 ANSWER 11 OF 15
AN CA108(8):65856b
TI Photo- and electrochemical reduction of carbon dioxide
AU Ziessel, Raymond
CS Inst. Le Bel, Univ. Louis Pasteur
LO Strasbourg 67000, Fr.
SO NATO ASI Ser., Ser. C, 206(Carbon Dioxide Source Carbon: Biochem. Chem. Uses), 113-38
SC 74-1 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)
SX 52, 67, 72
DT J
CO NSCSDW
PY 1987
LA Eng

L8 ANSWER 12 OF 15
AN CA93(16):160405j
TI Structures and redox behavior of transition metal complexes formed

with cyclic tetrapyrroles - syntheses of monomeric metal complexes for development of polymer materials having electric conductivity
AU Murakami, Yukito; Matsuda, Yoshihisa; Yamada, Sunao; Goto, Takashi; Kuramoto, Masahiko
CS Fac. Eng., Kyushu Univ.
LO Fukuoka, Japan
SO Kenkyu Hokoku - Asahi Garasu Kogyo Gijutsu Shoreikai, 34, 295-312
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72
DT J
CO AGKGAA
IS 0365-2599
PY 1979
LA Japan

L8 ANSWER 13 OF 15
AN CA73(10):51511g
TI ***Rhenium*** oxides. I. ***Rhenium*** trioxide electrode potentials in acid media
AU Poisson, Regis; Chartier, Pierre; Brenet, Jean
CS Lab. Electrochim. Chim. Phys. Crops Solide, Inst. Chim.
LO Strasbourg, Fr.
SO Bull. Soc. Chim. Fr., (4), 1275-8
SC 77 (Electrochemistry)
DT J
CO BSCFAS
PY 1970
LA Fr

L8 ANSWER 14 OF 15
AN CA71(22):106346y
TI Correlation of standard oxidation-reduction potentials with crystal chemical parameters in oxygen compounds of some transition metals
AU Goncharenko, A. S.
LO USSR
SO Zh. Neorg. Khim., 14(8), 2053-5
SC 70 (Crystallization and Crystal Structure)
DT J
CO ZNOKAQ
PY 1969
LA Russ

L8 ANSWER 15 OF 15
AN CA70(4):16589e
TI ***Redox*** ***potentials*** of ***rhenium*** in hydrochloric and sulfuric acid solutions
AU Henze, Guenter; Geyer, Rudolf
CS Tech. Hochsch. Chem. "Carl Schorlemmer" Leuna-Merseburg"
LO Merseburg, Ger.
SO Z. Chem., 8(9), 349-50
SC 77 (Electrochemistry)
DT J
CO ZECEAL PY 1968 LA Ger

=> s 14333-24-5 and redox(w)potentials not l8
388 14333-24-5
33790 REDOX
18448 POTENTIALS
910 REDOX(W)POTENTIALS

L9 0 14333-24-5 AND
REDOX(W)POTENTIALS NOT L8

=> s 14333-24-5 and redox(w)potential not l8
388 14333-24-5
33790 REDOX
198044 POTENTIAL
4315 REDOX(W)POTENTIAL

L10 1 14333-24-5 AND
REDOX(W)POTENTIAL NOT L8

=> d l10

L10 ANSWER 1 OF 1
AN CA91(24):201201u
TI ***Redox*** ***potential*** -pH
diagram of the

rhenum-sulfur-water system
AU Kanimov, K. K.; Ogorodnikov, Yu. I.
CS Inst. Metall. Obogashch.
LO Alma-Ata, USSR
SO Deposited Doc., VINITI 2913-78, 14 pp.
Avail. VINITI
SC 72-12 (Electrochemistry)
SX 54, 69
DT T
PY 1978
LA Russ

=> s technetium and redox(w)potential?
7649 TECHNETIUM
33790 REDOX
203416 POTENTIAL?
4627 REDOX(W)POTENTIAL?

L11 15 TECHNETIUM AND
REDOX(W)POTENTIAL?

=> s l11 not l8

L12 15 L11 NOT L8

=> d l12 1-15

L12 ANSWER 1 OF 15
AN CA118(8):72430t
TI Crown thioether chemistry. The first
homoleptic thioether complex
of ***technetium*** and its potential
application in tumor
imaging

AU White, David J.; Kuppers, Heinz Josef;
Edwards, Alison J.; Watkin,
David J.; Cooper, Stephen R.
CS Inorg. Chem. Lab., Univ. Oxford
LO Oxford OX1 3QR, UK
SO Inorg. Chem., 31(26), 5351-2
SC 78-7 (Inorganic Chemicals and Reactions)
SX 8, 72, 75
DT J
CO INOCAJ

IS 0020-1669
PY 1992
LA Eng
OS CJACS

L12 ANSWER 2 OF 15
AN CA116(14):137806a
TI Chemistry of the redox sensitive elements.
Literature review

AU Suter, Daniel
CS Paul Scherrer Inst.
LO CH-5232, Switz.
SO PSI-Ber., 113, 72 pp.
SC 71-0 (Nuclear Technology)
SX 72
DT T
CO PSIBEY
PY 1991
LA Eng

L12 ANSWER 3 OF 15
AN CA113(14):125272y
TI Ligand substitution reactions of
tetrachlorobis(triphenylphosphine)
technetium (IV)

AU Breikss, Anne I.; Davison, Alan; Jones,
Alun G.
CS Dep. Chem., Massachusetts Inst. Technol.
LO Cambridge, MA 02139, USA
SO Inorg. Chim. Acta, 170(1), 75-9
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72
DT J
CO ICHAA3
IS 0020-1693
PY 1990
LA Eng

L12 ANSWER 4 OF 15
AN CA111(4):32594y
TI Chemistry of ***technetium*** complexes
AU Konno, Takumi; Hidaka, Jinsai
CS Inst. Chem., Univ. Tsukuba
LO Ibaraki 305, Japan
SO Kagaku (Kyoto), 44(3), 202-3
SC 78-0 (Inorganic Chemicals and Reactions)
SX 72

DT J
CO KAKYAU
IS 0451-1964
PY 1989
LA Japan

L12 ANSWER 5 OF 15
AN CA110(18):162359r
TI Thermodynamic properties of
technetium (IV) oxides:
solubilities and the electrode potential of
the ***technetium***
(VII)/ ***technetium*** (IV)-oxide couple
AU Meyer, R. E.; Arnold, W. D.; Case, F. I.;
O'Kelley, G. D.
CS Oak Ridge Natl. Lab.
LO Oak Ridge, TN, USA
SO Report, ORNL-6480; Order No.
NUREG/CR-5108, 33 pp. Avail. NTIS
From: Gov. Rep. Announce. Index (U. S.) 1988,
88(20), Abstr. No.
859,865
SC 72-2 (Electrochemistry)
SX 68, 69, 71
DT T
PY 1988
LA Eng

L12 ANSWER 6 OF 15
AN CA109(24):213838k
TI ***Technetium*** in the hydrosphere and
in the geosphere. I.
Chemistry of ***technetium*** and iron in
natural waters and
influence of the ***redox***
potential on the sorption
of ***technetium***
AU Lieser, K. H.; Bauscher, C.
CS Fachber. Anorg. Chem. Kernchem., Tech.
Hochsch. Darmstadt
LO Darmstadt D-6100, Fed. Rep. Ger.
SO Radiochim. Acta, 42(4), 205-13
SC 53-11 (Mineralogical and Geological
Chemistry)
SX 61
DT J
CO RAACAP
IS 0033-8230
PY 1987
LA Eng

L12 ANSWER 7 OF 15
AN CA107(14):123081n
TI ***Technetium*** electrochemistry. 4.
Electrochemical and
spectroelectrochemical studies on the
bis(tertiary phosphine or
arsine (D))rhenium(III) complexes, trans-
[ReD₂X₂]⁺ (X = Cl, Br).
Comparison with the ***technetium***
(III) analogues
AU Kirchhoff, Jon R.; Heineman, William R.;
Deutsch, Edward
CS Dep. Chem., Univ. Cincinnati
LO Cincinnati, OH 45221-0172, USA
SO Inorg. Chem., 26(19), 3108-13
SC 72-2 (Electrochemistry)
SX 73, 78
DT J
CO INOCAJ

IS 0020-1669
PY 1987
LA Eng
OS CJACS

L12 ANSWER 8 OF 15
AN CA103(20):168646j
TI A spectroelectrochemical study of the
technetium (IV)/
technetium (III) couple in bicarbonate
solutions
AU Paquette, Jean; Lawrence, Warwick E.
CS Whiteshell Nucl. Res. Establ., At. Energy
Canada Ltd.
LO Pinawa, MB R0E 1L0, Can.
SO Can. J. Chem., 63(9), 2369-73
SC 72-2 (Electrochemistry)
SX 67, 68, 73
DT J
CO CJCHAG
IS 0008-4042
PY 1985
LA Eng

L12 ANSWER 9 OF 15
AN CA103(10):78153s
TI ***Technetium*** electrochemistry. 3.
Spectroelectrochemical
studies on the mixed-ligand
technetium (III) complexes
trans-[Tc(PR₂R')₂L]⁺ where L is a
tetradentate Schiff base ligand
and PR₂R' is a monodentate tertiary
phosphine ligand
AU Ichimura, Akio; Heineman, William R.;
Deutsch, Edward
CS Dep. Chem., Univ. Cincinnati
LO Cincinnati, OH 45221, USA
SO Inorg. Chem., 24(14), 2134-9
SC 72-2 (Electrochemistry)
SX 73, 78
DT J
CO INOCAJ
IS 0020-1669
PY 1985
LA Eng
OS CJACS

L12 ANSWER 10 OF 15
AN CA101(10):80437q
TI The behavior of ***technetium*** -99 in
doped-glass/basalt
hydrothermal interaction tests
AU Coles, D. G.; Apted, M. J.
CS Pac. Northwest Lab.
LO Richland, WA 99352, USA
SO Mater. Res. Soc. Symp. Proc., 26(Sci. Basis
Nucl. Waste Manage. 7),
129-36
SC 71-11 (Nuclear Technology)
SX 53, 57
DT J
CO MRSPDH
IS 0272-9172 PY 1984 LA Eng

L12 ANSWER 11 OF 15
AN CA100(20):164046d
TI ***Technetium*** electrochemistry. 2.
Electrochemical and
spectroelectrochemical studies of the
bis(tertiary phosphine) (D)
complexes trans-[TcIIID₂X₂]⁺ (X =chlorine or
bromine)
AU Ichimura, Akio; Heineman, William R.;
Vanderheyden, Jean Luc;
Deutsch, Edward
CS Dep. Chem., Univ. Cincinnati
LO Cincinnati, OH 45221, USA
SO Inorg. Chem., 23(9), 1272-8
SC 72-2 (Electrochemistry)
SX 8, 73, 78
DT J
CO INOCAJ
IS 0020-1669
PY 1984
LA Eng
OS CJACS

L12 ANSWER 12 OF 15
AN CA99(6):46958r
TI Synthesis, characterization, and
electrochemical properties of
tertiary diphosphine complexes of
technetium :
single-crystal structure of the prototype
complex
trans-[Tc(DPPE)₂Br₂]BF₄
AU Libson, Karen; Barnett, B. L.; Deutsch,
Edward
CS Dep. Chem., Univ. Cincinnati
LO Cincinnati, OH 45221, USA
SO Inorg. Chem., 22(12), 1695-704
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72, 73, 75
DT J
CO INOCAJ
IS 0020-1669
PY 1983
LA Eng
OS CJACS

L12 ANSWER 13 OF 15
AN CA94(14):111536q
TI Part I. Carbon and mercury-carbon optically
transparent electrodes.
Part II. Investigation of redox properties of
technetium
by cyclic voltammetry and thin layer
spectroelectrochemistry
AU Hurst, Roger Wilson
CS Univ. Cincinnati
LO Cincinnati, OH, USA
SO 210 pp. Avail. Univ. Microfilms Int.,
Order No. 8029669
From: Diss. Abstr. Int. B 1981, 41(7), 2601
SC 72-11 (Electrochemistry)
DT D
PY 1980
LA Eng

L12 ANSWER 14 OF 15
AN CA85(10):71471v
TI Chemistry of trans-
aquonitrosyltetraamminetechne-
tium(I) and
related
studies
AU Armstrong, Richard A.; Taube, Henry
CS Dep. Chem., Stanford Univ.
LO Stanford, Calif., USA
SO Inorg. Chem., 15(8), 1904-9
SC 78-7 (Inorganic Chemicals and Reactions)
SX 72
DT J
CO INOCAJ
PY 1976
LA Eng

L12 ANSWER 15 OF 15
AN CA79(16):100001a
TI Thiocyanato complexes of
technetium (IV) and -(V)
AU Schwochau, K.; Astheimer, L.; Schenk, H.
J.
CS Inst. Nuklearchem., Kernforsch. Juelich
G.m.b.H.
LO Juelich, Ger.
SO J. Inorg. Nucl. Chem., 35(7), 2249-57
SC 78-7 (Inorganic Chemicals and Reactions)
SX 70
DT J
CO JINCAO
PY 1973
LA Ger

=> s 14333-24-5
L13 388 14333-24-5

=> d l13 1-15

L13 ANSWER 1 OF 388
AN CA118(24):236879z
TI Polytetraalkylammonium and
polytrialkylamine-containing ligands
bonded to inorganic supports for removing and
concentrating ions
from solutions
AU Bruening, Ron; Tarbet, Bryon J.
CS Brigham Young University
LO USA
SO Eur. Pat. Appl., 14 pp.
PI EP 480386 A1 15 Apr 1992
DS R: AT, BE, CH, DE, DK, ES, FR, GB, IT, LI,
LU, NL, SE
AI EP 91-117160 8 Oct 1991
PRAI US 90-595309 10 Oct 1990
IC ICM B01J045-00
ICS B01J020-32; B01J041-04; B01J041-14
SC 48-1 (Unit Operations and Processes)
DT P
CO EPXXDW
PY 1992
LA Eng

L13 ANSWER 2 OF 388
AN CA118(22):215319b
TI Highly selective monoalkylene glycol catalysts
AU Forkner, Matthew William
CS Union Carbide Chemicals and Plastics Technology Corp.
LO USA
SO Eur. Pat. Appl., 17 pp.
PI EP 529726 A1 3 Mar 1993
DS R: BE, DE, ES, FR, GB, IT, NL
AI EP 92-202570 21 Aug 1992
PRAI US 91-749332 23 Aug 1991
IC ICM C07C029-10
ICS C07C031-20
SC 45-4 (Industrial Organic Chemicals, Leather, Fats, and Waxes)
SX 67
DT P
CO EPXXDW
PY 1993
LA Eng

L13 ANSWER 3 OF 388
AN CA118(18):176907v
TI Correlation parameters for predicting anion-exchange extraction constants for 287 extraction systems containing 236 different anions on an ES computer with the program OPAG2
AU Mezhev, E. A.; Reymarov, G. A.; Khananishvili, N. L.; Schmidt, V. S.
LO Russia
SO Radiokhimiya, 34(1), 9-50
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
SX 20, 48, 54
DT J
CO RADKAU
IS 0033-8311
PY 1992
LA Russ

L13 ANSWER 4 OF 388
AN CA118(16):157019r
TI Raman spectra, absolute Raman intensities, and electrooptical parameters of pertechnetate, perrhenate, and periodate ions in aqueous solution
AU Eysel, Hans H.; Kanellakopoulos, Basil
CS Anorg.-Chem. Inst., Univ. Heidelberg
LO Heidelberg 6900/1, Germany
SO J. Raman Spectrosc., 24(2), 119-22
SC 73-3 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
SX 78
DT J
CO JRSPAF
IS 0377-0486
PY 1993
LA Eng

L13 ANSWER 5 OF 388
AN CA118(4):27719h
TI Ab initio study of the oxides of rhenium and their anions
AU Boehm, Randall C.; Banerjee, Ajit
CS Theory Proj., Chem. Sci., Idaho Natl. Eng. Lab., E G and G of Idaho, Inc. P.O. Box 1625
LO Idaho Falls, ID 83415-2208, USA
SO Chem. Phys., 167(3), 291-7
SC 65-5 (General Physical Chemistry)
DT J
CO CMPHC2
IS 0301-0104
PY 1992
LA Eng

L13 ANSWER 6 OF 388
AN CA118(2):12320x
TI Studies on the extraction of perrhenate by use of crown ethers
AU Jewad, S. K.; Al-Murab, S. R.; Jalhoom, M. G.
CS Coll. Educ., Univ. Baghdad
LO Baghdad, Iraq
SO Process Metall., 7A(Solvent Extr. 1990, Pt. A), 907-11
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
SX 69
DT J
CO PMETEQ
PY 1992
LA Eng

L13 ANSWER 7 OF 388
AN CA117(25):247582c
TI Interaction of porcine uterine fluid purple acid phosphatase with vanadate and vanadyl cation
AU Crans, Debbie C.; Simone, Carmen M.; Holz, Richard C.; Que, Lawrence, Jr.
CS Dep. Chem., Colorado State Univ.
LO Fort Collins, CO 80523, USA
SO Biochemistry, 31(47), 11731-9
SC 7-3 (Enzymes)
DT J
CO BICHAW
IS 0006-2960
PY 1992
LA Eng
OS CJACS

L13 ANSWER 8 OF 388
AN CA117(8):79005w
TI Vibrational spectra and local symmetry of
impurity tetrahedral
anions of perrhenate(ReO_4^-) in cesium
halide crystals
AU Glinka, Yu. D.; Govorun, D. N.;
Kushnirenko, I. Ya.; Kumeskii, V. R.
CS Kiev. Gos. Univ.
LO Kiev, Ukraine
SO Zh. Prikl. Spektrosk., 56(5-6), 757-62
SC 73-3 (Optical, Electron, and Mass
Spectroscopy and Other Related
Properties)
DT J
CO ZPSBAX
IS 0514-7506
PY 1992
LA Russ

L13 ANSWER 9 OF 388
AN CA116(20):206729s
TI Extraction and adsorption of chloro
complexes, perrhenate (ReO_4^-),
and tetrafluoroborate (BF_4^-) with crown
ethers and a crown ether
polymer
AU Onishi, Hiroshi; Koshima, Hideko
CS Dep. Chem., Univ. Tsukuba
LO Tsukuba 305, Japan
SO Anal. Sci., 7(Suppl., Proc. Int. Congr. Anal.
Sci., 1991, Pt. 1),
45-6
SC 79-0 (Inorganic Analytical Chemistry)
SX 68
DT J
CO ANSCEN
IS 0910-6340
PY 1991
LA Eng

L13 ANSWER 10 OF 388
AN CA116(19):194575y
TI The synthesis of high oxidation state metal
complexes containing the
tripodal ligand [(η^5 -
 C_5H_5)Co{P(OMe) $_2$ (O)} $_3$]- and the x-ray
crystal structure of the cobalt-rhenium
complex [(η^5 -
 C_5H_5)Co{P(OMe) $_2$ (O)} $_3$ ReO $_3$]. [Erratum to
document cited in
CA114(7):62334t]
AU Banbery, Hilary J.; Hussain, Wasif;
Evans, Iona G.; Hamor, Thomas
A.; Jones, Christopher J.; McCleverty, Jon A.;
Schulte, Heinz Josef;
Engels, Birgit; Kläui, Wolfgang
CS Sch. Chem., Univ. Birmingham
LO Edgbaston/Birmingham B15 2TT, UK
SO Polyhedron, 11(3), 393
SC 29-13 (Organometallic and
Organometalloidal Compounds)
SX 75
DT J

CO PLYHDE
IS 0277-5387
PY 1992
LA Eng

L13 ANSWER 11 OF 388
AN CA116(16):165305e
TI Film-type perrhenate-selective electrode
AU Mansurov, M. M.; Urmanov, E. G.;
Semenova, G. L.; Lugovenko, A. N.
CS Tadzh. State Univ.
LO Dushanbe, USSR
SO Zh. Anal. Khim., 46(7), 1325-9
SC 79-6 (Inorganic Analytical Chemistry)
SX 72
DT J
CO ZAKHA8
IS 0044-4502
PY 1991
LA Russ

L13 ANSWER 12 OF 388
AN CA116(16):163040r
TI Generation of the pretilt angles in nematic
liquid crystal (5CB)
aligned on the rubbed polypyrrole films
AU Seo, Dae Shik; Kobayashi, Shunsuke;
Mochizuki, Akihiro
CS Grad. Sch. Technol., Tokyo Univ. Agric.
Technol.
LO Koganei 184, Japan
SO Appl. Phys. Lett., 60(8), 1025-6
SC 75-11 (Crystallography and Liquid
Crystals)
DT J
CO APPLAB
IS 0003-6951
PY 1992
LA Eng

L13 ANSWER 13 OF 388
AN CA116(16):160183d
TI Method of estimation of the enthalpy of
formation and free enthalpy
of formation of inorganic compounds
AU Ducros, M.; Sannier, H.
CS Groupe Rech. Combust. Thermochem., Ec.
Natl. Super. Tech. Av.
LO Palaiseau 91120, Fr.
SO Thermochem. Acta, 196(1), 27-43
SC 69-2 (Thermodynamics, Thermochemistry,
and Thermal Properties)
DT J
CO THACAS
IS 0040-6031
PY 1992
LA Fr

L13 ANSWER 14 OF 388
AN CA116(7):57330a
TI Method and kit for radiolabeling
monovalent antibody fragments and
other proteins
AU Chang, Chien Hsing; Jones, Anastasia
Lentine
CS Immunomedics, Inc.
LO USA
SO PCT Int. Appl., 25 pp.
PI WO 9117440 A1 14 Nov 1991
DS W: AT, AU, BB, BG, BR, CA, CH, DE, DK,
ES, FI, GB, HU, JP, KP, KR,
LK, LU, MC, MG, MW, NL, NO, RO, SD,
SE, SU
RW: AT, BE, BJ, CF, CG, CH, CM, DE, DK,
ES, FR, GA, GB, GR, IT, LU,
ML, MR, NL, SE, SN, TD, TG
AI WO 91-US1326 5 Mar 1991
PRAI US 90-518707 7 May 1990
IC ICM G01N033-534
ICS G01N033-563; C07K003-28; C07K015-06
SC 15-1 (Immunochemistry)
SX 9
DT P
CO PIXXD2
PY 1991
LA Eng

L13 ANSWER 15 OF 388
AN CA116(6):50421x
TI Potentiometric determination of
perrhenates in products from
synthesis of rhenium carbonyls
AU Ranskii, A. P.; Bovykin, B. A.; Shram, V.
P.; Gritsayuk, S. N.;
Artyukhova, E. P.; Kolyada, V. I.;
Shtemenko, A. V.
LO USSR
SO Vopr. Khim. Khim. Tekhnol., 93, 25-8
SC 79-6 (Inorganic Analytical Chemistry)
DT J
CO VKKCAJ
IS 0321-4095
PY 1990
LA Russ

=> s 14333-20-1
L14 308 14333-20-1

=> d l14 1-15

L14 ANSWER 1 OF 308
AN CA118(24):236879z
TI Polytetraalkylammonium and
polytrialkylamine-containing ligands
bonded to inorganic supports for removing and
concentrating ions
from solutions
AU Bruening, Ron; Tarbet, Bryon J.
CS Brigham Young University
LO USA
SO Eur. Pat. Appl., 14 pp.
PI EP 480386 A1 15 Apr 1992

DS R: AT, BE, CH, DE, DK, ES, FR, GB, IT, LI,
LU, NL, SE
AI EP 91-117160 8 Oct 1991
PRAI US 90-595309 10 Oct 1990
IC ICM B01J045-00
ICS B01J020-32; B01J041-04; B01J041-14
SC 48-1 (Unit Operations and Processes)
DT P
CO EPXXDW
PY 1992
LA Eng

L14 ANSWER 2 OF 308
AN CA118(20):199940q
TI Anion retention in soil: possible application
to reduce migration of
buried technetium and iodine: a review
AU Gu, B.; Schulz, R. K.
CS Dep. Soil Sci., Univ. California
LO Berkeley, CA, USA
SO Report, NUREG/CR-5464, 33 pp. Avail.
NTIS
From: Energy Res. Abstr. 1992, 17(2), Abstr.
No. 4907
SC 71-0 (Nuclear Technology)
SX 19
DT T
PY 1991
LA Eng

L14 ANSWER 3 OF 308
AN CA118(18):176907v
TI Correlation parameters for predicting
anion-exchange extraction
constants for 287 extraction systems
containing 236 different anions
on an ES computer with the program OPAG2
AU Mezhev, E. A.; Reymarov, G. A.;
Khananishvili, N. L.; Schmidt, V. S.
LO Russia
SO Radiokhimiya, 34(1), 9-50
SC 68-2 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 20, 48, 54
DT J
CO RADKAU
IS 0033-8311
PY 1992
LA Russ

L14 ANSWER 4 OF 308
AN CA118(16):157019r
TI Raman spectra, absolute Raman intensities,
and electrooptical
parameters of pertechnetate, perrhenate,
and periodate ions in
aqueous solution

AU Eysel, Hans H.; Kanellakopoulos, Basil
CS Anorg.-Chem. Inst., Univ. Heidelberg
LO Heidelberg 6900/1, Germany
SO J. Raman Spectrosc., 24(2), 119-22
SC 73-3 (Optical, Electron, and Mass
Spectroscopy and Other Related
Properties)

SX 78
DT J
CO JRSPAF
IS 0377-0486
PY 1993
LA Eng

L14 ANSWER 5 OF 308
AN CA118(10):93069x
TI Reactivities of technetium complexes
AU Omori, Takashi
CS Sci. Coll., Tohoku Univ.
LO Sendai, Japan
SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
Rep.], KURRI-TR-362, 3-7

SC 78-0 (Inorganic Chemicals and Reactions)
SX 67
DT T
CO KDGHDH
IS 0287-9808
PY 1991
LA Japan

L14 ANSWER 6 OF 308
AN CA118(8):68680g
TI Technetium-99 removal from process
solutions and contaminated
groundwater

AU Del Cul, G. D.; Bostick, W. D.; Trotter, D.
R.; Osborne, P. E.

CS Dep. Chem., Oak Ridge K-25 Site
LO Oak Ridge, TN 37831-7274, USA
SO Sep. Sci. Technol., 28(1-3), 551-64
SC 71-11 (Nuclear Technology)

SX 61, 66
DT J
CO SSTEDS
IS 0149-6395
PY 1993
LA Eng

L14 ANSWER 7 OF 308
AN CA118(6):47723h
TI Adsorption of technetium from acidic
solutions

AU Ito, K.
CS Tohoku Univ.
LO Sendai, Japan
SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
Rep.], KURRI-TR-362, 60-5

SC 71-11 (Nuclear Technology)

SX 66
DT T
CO KDGHDH
IS 0287-9808
PY 1991
LA Japan

L14 ANSWER 8 OF 308
AN CA118(6):47585q
TI Nuclear reactions of technetium with
possible availability and new
approach to technetium analysis by laser
photoacoustic spectroscopy

AU Yoshihara, K.
CS Sci. Coll., Tohoku Univ.
LO Sendai, Japan
SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
Rep.], KURRI-TR-362, 42-3
SC 71-6 (Nuclear Technology)

SX 70, 73, 79
DT T
CO KDGHDH
IS 0287-9808
PY 1991
LA Japan

L14 ANSWER 9 OF 308
AN CA118(6):47351k
TI The solution chemistry of technetium on the
radioactive waste
disposal

AU Kanno, T.
CS Tohoku Univ.
LO Sendai, Japan
SO Kyoto Daigaku Genshiro Jikkensho, [Tech.
Rep.], KURRI-TR-362, 50-9
SC 71-0 (Nuclear Technology)

SX 53, 66
DT T
CO KDGHDH
IS 0287-9808
PY 1991
LA Japan

L14 ANSWER 10 OF 308
AN CA117(18):178285u
TI The determination of charge of anionic
technetium-99m

radiopharmaceuticals
AU Nowotnik, D. P.; Riley, A. L. M.
CS Amersham Int. plc
LO Amersham HP7 9LL, UK
SO J. Liq. Chromatogr., 15(12), 2165-74
SC 63-8 (Pharmaceuticals)

SX 8
DT J
CO JLCHD8
IS 0148-3919
PY 1992
LA Eng

L14 ANSWER 11 OF 308
AN CA117(12):120214d
TI The behavior of decomposition products of hydrazine in PUREX process
AU Zil'berman, B. Ya.; Lelyuk, G. A.; Mashkin, A. N.; Fedorov, Yu. S.
CS V.G. Khlopin Radium Inst.
LO Leningrad 197022, USSR
SO Process Metall., 7A(Solvent Extr. 1990, Pt. A), 759-64
SC 71-5 (Nuclear Technology)
DT J
CO PMETEQ
PY 1992
LA Eng

L14 ANSWER 12 OF 308
AN CA117(10):99422h
TI Behavior of pertechnetate ion adsorption from aqueous solutions shown by activated carbons derived from different sources
AU Ito, Katsuo; Yachidate, Akira
CS Res. Inst. Miner. Dress. Metall., Tohoku Univ.
LO Sendai 980, Japan
SO Carbon, 30(5), 767-71
SC 71-11 (Nuclear Technology)
DT J
CO CRBNAH
IS 0008-6223
PY 1992
LA Eng

L14 ANSWER 13 OF 308
AN CA117(10):99416j
TI Characterization of grouted low-level waste to support performance assessment
AU Serne, R. J.; Lokken, R. O.; Criscenti, L. J.
CS Pac. Northwest Lab.
LO Richland, WA, USA
SO Waste Manage. (N. Y.), 12(2-3), 271-87
SC 71-11 (Nuclear Technology)
SX 58
DT J
CO WAMAE2
IS 0956-053X
PY 1992
LA Eng

L14 ANSWER 14 OF 308
AN CA117(6):56964u
TI Aqueous partial molar heat capacities and volumes for sodium pertechnetate and sodium perrhenate
AU Lemire, R. J.; Saluja, P. P. S.; Campbell, A. B.
CS Res. Chem. Branch, AECL Res.
LO Pinawa, MB R0E 1L0, Can.
SO J. Solution Chem., 21(6), 507-23
SC 69-2 (Thermodynamics, Thermochemistry, and Thermal Properties)
SX 68, 71

DT J
CO JSLCAG
IS 0095-9782
PY 1992
LA Eng

L14 ANSWER 15 OF 308
AN CA116(19):194575y
TI The synthesis of high oxidation state metal complexes containing the tripodal ligand [(eta-5-C5H5)Co{P(OMe)2(O)}3]- and the x-ray crystal structure of the cobalt-rhenium complex [(eta-5-C5H5)Co{P(OMe)2(O)}3ReO3]. [Erratum to document cited in CA114(7):62334t]
AU Banbery, Hilary J.; Hussain, Wasif; Evans, Iona G.; Hamor, Thomas A.; Jones, Christopher J.; McCleverty, Jon A.; Schulte, Heinz Josef; Engels, Birgit; Klæui, Wolfgang
CS Sch. Chem., Univ. Birmingham
LO Edgbaston/Birmingham B15 2TT, UK
SO Polyhedron, 11(3), 393
SC 29-13 (Organometallic and Organometalloidal Compounds)
SX 75
DT J
CO PLYHDE
IS 0277-5387
PY 1992
LA Eng

=> d l14 16-30

L14 ANSWER 16 OF 308
AN CA116(10):98499f
TI Rapid and sensitive determination of pertechnetate in molybdenum-99/metastable technetium-99 generator eluates by reversed-phase high-performance liquid chromatography
AU Amano, R.
CS Sch. Allied Med. Prof., Kanazawa Univ.
LO Kanazawa 920, Japan
SO J. Radioanal. Nucl. Chem., 152(1), 81-6
SC 79-6 (Inorganic Analytical Chemistry)
SX 64
DT J
CO JRNCMD
IS 0236-5731
PY 1991
LA Eng

L14 ANSWER 17 OF 308
AN CA116(10):93591v
TI On the interaction of granite with
technetium(IV) and
technetium(VII) in aqueous solution
AU Eriksen, Trygve E.; Cui, Daqing
CS Dep. Nucl. Chem., R. Inst. Technol.
LO Stockholm, Swed.
SO SKB Tech. Rep., 91-47, 36 pp.
SC 71-11 (Nuclear Technology)
SX 68
DT T
CO STRPEP
IS 0284-3757
PY 1991
LA Eng

L14 ANSWER 18 OF 308
AN CA116(9):83167x
TI Synthesis of a new class of technetium
chelating agents: N2S2
monoaminemonoamide (MAMA) ligands
AU Gustavson, Linda M.; Rao, T. N.; Jones,
David S.; Fritzberg, Alan
R.; Srinivasan, Ananthachari
CS NeoRx Corp.
LO Seattle, WA 98119, USA
SO Tetrahedron Lett., 32(40), 5485-8
SC 23-8 (Aliphatic Compounds)
DT J
CO TELEAY
IS 0040-4039
PY 1991
LA Eng
OS CASREACT 116:83167

L14 ANSWER 19 OF 308
AN CA116(8):70103y
TI Solute transport benchmark studies for
TRACR3D code verification
AU Thomas, T. R.
CS Westinghouse Idaho Nucl. Co., Inc.
LO Idaho Falls, ID, USA
SO Report, WINCO-1083; Order No.
DE91008918, 45 pp. Avail. NTIS
From: Energy Res. Abstr. 1991, 16(5), Abstr.
No. 12549
SC 71-11 (Nuclear Technology)
SX 53
DT T
PY 1991
LA Eng

L14 ANSWER 20 OF 308
AN CA116(7):57330a
TI Method and kit for radiolabeling
monovalent antibody fragments and
other proteins
AU Chang, Chien Hsing; Jones, Anastasia
Lentine
CS Immunomedics, Inc.
LO USA
SO PCT Int. Appl., 25 pp.
PI WO 9117440 A1 14 Nov 1991

DS W: AT, AU, BB, BG, BR, CA, CH, DE, DK,
ES, FI, GB, HU, JP, KP, KR,
LK, LU, MC, MG, MW, NL, NO, RO, SD,
SE, SU
RW: AT, BE, BJ, CF, CG, CH, CM, DE, DK,
ES, FR, GA, GB, GR, IT, LU,
ML, MR, NL, SE, SN, TD, TG
AI WO 91-US1326 5 Mar 1991
PRAI US 90-518707 7 May 1990
IC ICM G01N033-534
ICS G01N033-563; C07K003-28; C07K015-06
SC 15-1 (Immunochemistry)
SX 9
DT P
CO PIXXD2
PY 1991
LA Eng

L14 ANSWER 21 OF 308
AN CA116(6):46984r
TI Adsorption of pertechnetate ion on active
carbon from acids and
their salt solutions
AU Ito, K.; Akiba, K.
CS Res. Inst. Miner. Dressing and Metall.,
Tohoku Univ.
LO Sendai 980, Japan
SO J. Radioanal. Nucl. Chem., 152(2), 381-90
SC 66-4 (Surface Chemistry and Colloids)
SX 71
DT J
CO JRNCMD
IS 0236-5731
PY 1991
LA Eng

L14 ANSWER 22 OF 308
AN CA115(22):242375m
TI The electrode potential of the
technetium(IV)-technetium(VII) couple
AU Meyer, R. E.; Arnold, W. D.
CS Oak Ridge Natl. Lab.
LO Oak Ridge, TN 37831-6201, USA
SO Radiochim. Acta, 55(1), 19-22
SC 72-2 (Electrochemistry)
DT J
CO RAACAP
IS 0033-8230
PY 1991 LA Eng

L14 ANSWER 23 OF 308
AN CA115(12):122178c
TI Migration of radionuclides in fracture
columns
AU Holtta, Pirkko; Hakanen, Martti;
Hautojarvi, Aimo
CS Dep. Radiochem., Univ. Helsinki
LO Helsinki SF-00170, Finland
SO Mater. Res. Soc. Symp. Proc., 212(Sci. Basis
Nucl. Waste Manage.
14), 669-76
SC 71-11 (Nuclear Technology) SX 53
DT J CO MRSPDH IS 0272-9172
PY 1991 LA Eng

L14 ANSWER 24 OF 308
AN CA115(9):88306f
TI Determination of isoenzymes
AU Abbott, William A.
CS Abbott Laboratories
LO USA
SO Eur. Pat. Appl., 24 pp.
PI EP 401641 A2 12 Dec 1990
DS R: AT, BE, CH, DE, ES, FR, GB, IT, LI, NL
AI EP 90-110104 28 May 1990
PRAI US 89-364400 9 Jun 1989
IC ICM C12Q001-00
ICS C12Q001-32; C12Q001-50; C12Q001-42;
C12Q001-52
SC 7-1 (Enzymes)
DT P
CO EPXXDW
PY 1990
LA Eng

L14 ANSWER 25 OF 308
AN CA115(8):80633q
TI Site and safety studies of the Asse Salt
Mine and engineering
developments
AU Bode, W.; Hensel, G.; Hente, B.; Herbert,
H. J.; Reichelt, C.;
Sander, W.; Starke, C.; Grisseemann, C.
CS Inst. Tieflagerung, GSF-Forschungszent.
Umwelt und Gesundheit
G.m.b.H.
LO Neuherberg D-8042, Fed. Rep. Ger.
SO GSF-Ber., 31/90, 101 pp.
SC 71-11 (Nuclear Technology)
DT T
CO GSFBEEM
IS 0721-1694
PY 1991
LA Ger

L14 ANSWER 26 OF 308
AN CA115(3):26033f
TI Rapid uptake of technetium-99m
pertechnetate ($^{99m}\text{TcO}_4^-$) by several
plants
AU Amano, Ryohei; Ando, Atsushi; Hiraki,
Tatsunosuke; Mori, Hirofumi;
Matsuda, Hiroshi; Hisada, Kinichi
CS Sch. Allied Med. Prof., Kanazawa Univ.
LO Kanazawa 920, Japan
SO Radioisotopes, 39(12), 585-6
SC 11-2 (Plant Biochemistry)
DT J
CO RAISAB
IS 0033-8303
PY 1990
LA Eng

L14 ANSWER 27 OF 308
AN CA115(3):25786s
TI Technetium uptake by the green alga
Chlorella fusca
AU Mueller, H.; Ter Meer-Bekk, C.
CS Inst. Inorg. Anal. Chem., Univ. Freiburg

LO Freiburg D-7800, Fed. Rep. Ger.
SO J. Radioanal. Nucl. Chem., 154(1), 37-9
SC 10-2 (Microbial Biochemistry)
SX 11
DT J
CO JRNCMD
IS 0236-5731
PY 1991
LA Eng

L14 ANSWER 28 OF 308
AN CA114(24):236425r
TI Diffusion of americium, plutonium, uranium,
neptunium, cesium,
iodine, and technetium in compacted sand-
bentonite mixture
AU Albinsson, Yngve; Engkvist, Ingemar
CS Dep. Nucl. Chem., Chalmers Univ.
Technol.
LO Goeteborg S-412 96, Swed.
SO Radioact. Waste Manage. Nucl. Fuel
Cycle, 15(4), 221-39
SC 71-11 (Nuclear Technology)
DT J
CO RWMCD4
IS 0739-5876
PY 1991
LA Eng

L14 ANSWER 29 OF 308
AN CA114(14):131370r
TI A technetium rejection flowsheet
AU Baker, R.; Miles, J. H.; Roberts, P. T.
CS Process Serv. Div., AEA Fuel Serv.
LO Harwell/Oxon OX11 0RA, UK
SO Inst. Chem. Eng. Symp. Ser., 119(Extraction
'90), 213-19
SC 71-5 (Nuclear Technology)
DT J
CO ICESDB
IS 0307-0492
PY 1990
LA Eng

L14 ANSWER 30 OF 308
AN CA114(9):77949w
TI Novel technetium-99m complexes for
radiopharmaceutical imaging
agents
AU Dunn, T. Jeffrey; Nosco, Dennis; Woulfe,
Steven; Dean, Richard;
Wester, Dennis
CS Mallinckrodt, Inc.
LO USA
SO PCT Int. Appl., 119 pp.
PI WO 9000854 A1 8 Feb 1990
DS W: AU, JP
RW: AT, BE, CH, DE, FR, GB, IT, LU, NL, SE
AI WO 89-US3066 18 Jul 1989
PRAI US 88-221099 19 Jul 1988
US 89-315168 24 Feb 1989
IC ICM C07F013-00
ICS A61K049-02; C07C251-24; C07C217-48;
C07C215-50; C07C251-08;
C07F005-04; C07F009-50
SC 8-9 (Radiation Biochemistry)
SX 25, 78
DT P
CO PIXXD2
PY 1990
LA Eng
OS MARPAT 114:77949

=> s 14333-20-1 and environment?
308 14333-20-1
75860 ENVIRONMENT?

L7 1 14333-20-1 AND ENVIRONMENT?

=> d 17

L7 ANSWER 1 OF 1
AN CA111(24):220568s
TI The chemical speciation of technetium in
the ***environment***
A literature survey
AU Sparkes, S. T.; Long, S. E.
CS Environ. Med. Sci. Div., Harwell Lab.
LO Oxfordshire OX11 0RA, UK
SO U. K. At. Energy Auth., Harwell Lab.,
[Rep.] AERE-R, AERE R 12743,
32 pp.
SC 71-0 (Nuclear Technology)
DT T
CO UKRGAL
IS 0436-9734
PY 1988
LA Eng

=> s 14333-20-1 and separat?
308 14333-20-1
95976 SEPARAT?

L8 12 14333-20-1 AND SEPARAT?

=> d 18 ti,au,so,py

L8 ANSWER 1 OF 12
TI ***Separation*** of anionic and cationic
compounds of biomedical

interest by high-performance liquid
chromatography on porous
graphitic carbon
AU Gu, Guanghua; Lim, C. K.
SO J. Chromatogr., 515, 183-92
PY 1990

=> d 18 2-12 ti,au,so,py

L8 ANSWER 2 OF 12
TI ***Separation*** of the noble metals
ruthenium and palladium
from a nitric acid solution of a nuclear fuel
reprocessing stream
containing complexing agents
AU Ghafourian, Hossein
SO Kernforschungszent. Karlsruhe, [Ber.] KfK,
KfK 4568, 125 pp.
PY 1989

L8 ANSWER 3 OF 12
TI Electronic interaction chromatography on
porous graphitic carbon.
Separation of [99mTc]pertechnetate
and perrhenate anions
AU Lim, C. K.
SO Biomed. Chromatogr., 3(2), 92-3
PY 1989

L8 ANSWER 4 OF 12
TI ***Separation*** of radionuclides from
water by magnesium oxide
adsorption
AU Tseng, Chia Lian; Lo, Jem Mau; Yeh, Si
Jung
SO Anal. Sci., 3(5), 437-40
PY 1987

L8 ANSWER 5 OF 12
TI Silica gel supported microcrystalline
zirconium phosphate ion
exchanger (Si-ZrP) and its application in
chemical
separations . III. ***Separation***
of alkali and
transition metal ions
AU Le Van So; Szirtes, L.
SO J. Radioanal. Nucl. Chem., 99(1), 55-60
PY 1986

L8 ANSWER 6 OF 12
TI ***Separation*** of uranium from
technetium in recovery of spent
nuclear fuel
AU Friedman, Horace A.
SO U.S., 4 pp.
PY 1985

L8 ANSWER 7 OF 12
TI Ion-exchange ***separation*** and preparation of metallic technetium
AU Spitsyn, V. I.; Kuzina, A. F.; Oblova, A. A.; Tsarenko, A. F.
SO Poluch. i Vydelenie Radioaktiv. Izotopov, Tashkent 105-9
From: Ref. Zh., Khim. 1984, Abstr. No. 5B4506
PY 1983

L8 ANSWER 8 OF 12
TI Extraction of some single-charged oxo anions by tetraoctylammonium nitrate
AU Dzhigirkhanov, M. A.; Matyunin, Yu. I.
SO Deposited Doc., VINITI 575-82, 365-9 Avail. VINITI
PY 1981

L8 ANSWER 9 OF 12
TI ***Separation*** of technetium(VII) from technetium(IV) by solvent extraction
AU Ianovici, E.; Lerch, P.; Proso, Z.; Maddock, A. G.
SO J. Radioanal. Chem., 46(1), 11-19
PY 1978

L8 ANSWER 10 OF 12
TI ***Separation*** of technetium from fission products by extraction with trialkyl amines in tetrachloromethane
AU Macasek, Fedor; Rajec, Pavol; Mikulaj, Vladimir; Kopunec, Rudolf; Cech, Roman
SO Collect. Czech. Chem. Commun., 43(1), 200-8
PY 1978

L8 ANSWER 11 OF 12
TI ***Separation*** of molybdate, pertechnetate, iodate, iodide, and ruthenate ions using thin-layer chromatography
AU Makie, Y.; Murakami, Y.
SO Nippon Kagaku Kaishi, No. 1, 85-90
PY 1973

L8 ANSWER 12 OF 12
TI ***Separation*** of molybdate, pertechnetate, iodate, iodide, and ruthenate ions using a thin-layer chromatographic method
AU Maki, Yasuyuki; Murakami, Yukio
SO Nippon Kagaku Kaishi, (1), 85-90
PY 1973

=> d l8 8

L8 ANSWER 8 OF 12
AN CA98(16):133078b

TI Extraction of some single-charged oxo anions by tetraoctylammonium nitrate
AU Dzhigirkhanov, M. A.; Matyunin, Yu. I.
CS Khim. Fak., Mosk. Gos. Univ.
LO Moscow, USSR
SO Deposited Doc., VINITI 575-82, 365-9 Avail. VINITI
SC 68-2 (Phase Equilibriums, Chemical Equilibriums, and Solutions)
SX 71
DT T
PY 1981
LA Russ

=> s 14333-20-1 and extract?
308 14333-20-1
85108 EXTRACT?

L9 28 14333-20-1 AND EXTRACT?

=> s l9 not l8
L10 25 L9 NOT L8

=> d l10 1-25 ti,au,so,py

L10 ANSWER 1 OF 25
TI Correlation parameters for predicting anion-exchange ***extraction*** constants for 287 ***extraction*** systems containing 236 different anions on an ES computer with the program OPAG2
AU Mezhev, E. A.; Reymarov, G. A.; Khananishvili, N. L.; Schmidt, V. S.
SO Radiokhimiya, 34(1), 9-50
PY 1992

L10 ANSWER 2 OF 25
TI The behavior of decomposition products of hydrazine in PUREX process
AU Zil'berman, B. Ya.; Lelyuk, G. A.; Mashkin, A. N.; Fedorov, Yu. S.
SO Process Metall., 7A(Solvent Extr. 1990, Pt. A), 759-64
PY 1992

L10 ANSWER 3 OF 25
TI ***Extraction*** of pertechnetate anion as a ligand in a cerium(IV) tributyl phosphate complex
AU Akopov, G. A.; Krinitsyn, A. P.; Tsarenko, A. F.
SO J. Radioanal. Nucl. Chem., 140(2), 349-56
PY 1990

L10 ANSWER 4 OF 25
TI Alkyl and arylphosphonium nitrate salts as ***extractants*** for pertechnetate
AU Tse, Pui Kwan; Horwitz, E. Philip
SO Solvent Extr. Ion Exch., 8(2), 353-60
PY 1990

- L10 ANSWER 5 OF 25
 TI Preferential solvation of single ions and the TBP- ***extraction*** behavior of acids, uranyl pertechnetate and uranyl nitrate
 AU Kanellakopulos, B.; Neck, V.; Kim, J. I.
 SO Radiochim. Acta, 48(3-4), 159-63
 PY 1989
- L10 ANSWER 6 OF 25
 TI Studies on the ***extraction*** of TcO₄- from solutions of mono- and bivalent metal hydroxides by use of Kryptofix-22 in 1,2-dichloroethane
 AU Jalhoom, Muayed G.
 SO Proc. Int. Conf. Sep. Sci. Technol., 2nd, Volume 2, 661-6. Edited by: Baird, M. H. I.; Vijayan, S. Can. Soc. Chem. Eng.: Ottawa, Ont.
 PY 1989
- L10 ANSWER 7 OF 25
 TI Antimony ***extraction*** from nitric acid solutions by tributyl phosphate. III. The influence of iodide and pertechnetate ions on the ***extraction*** of antimony from nitric acid solutions by tributyl phosphate
 AU Lakaev, V. S.; Smelov, V. S.
 SO Radiokhimiya, 30(4), 481-4
 PY 1988
- L10 ANSWER 8 OF 25
 TI ***Extraction*** of pertechnetate ions by use of crown ethers from sulfuric acid solutions
 AU Jalhoom, M. G.
 SO Radiochim. Acta, 39(4), 195-7
 PY 1986
- L10 ANSWER 9 OF 25
 TI A convenient method on the methyl-ethyl-ketone ***extraction*** of pertechnetate (99mTcO₄-)
 AU Lee, Jong Du; Lee, Byung Hun
 SO Pangsason Pango Hakhoechi, 9(2), 103-11
 PY 1984
- L10 ANSWER 10 OF 25
 TI Solubility and ***extraction*** of tetraphenylarsonium pertechnetate [(C₆H₅)₄AsTcO₄]; thermodynamic investigations
 AU Neck, V.; Kanellakopulos, B.; Kim, J. I.
 SO Kernforschungszent. Karlsruhe, [Ber.] KfK, KfK 3998, 65 pp.
 PY 1985
- L10 ANSWER 11 OF 25
 TI ***Extraction*** of nitric acid, technetium and palladium by bidentate carbamoylphosphonates
- AU Gorski, B.; Kuca, L.; Petrzilova, H.
 SO J. Radioanal. Nucl. Chem., 91(2), 305-13
 PY 1985
- L10 ANSWER 12 OF 25
 TI Co- ***extraction*** of pertechnetate with zirconium(IV) in the TBP-nitric acid system
 AU Jassim, T. N.; Persson, G.; Liljenzin, J. O.
 SO Solvent Extr. Ion Exch., 2(7-8), 1079-92
 PY 1984
- L10 ANSWER 13 OF 25
 TI ***Extraction*** potential of trialkylsulfonium nitrates
 AU Dzhigirkhanov, M. S.; Silant'ev, A. I.
 SO Deposited Doc., VINITI 575-82, 370-4 Avail. VINITI
 PY 1981
- L10 ANSWER 14 OF 25
 TI ***Extraction*** of some singly and doubly charged anions by trialkylsulfonium nitrate
 AU Dzhigirkhanov, M. S.; Abramov, A. A.; Silant'ev, A. I.; Iofa, B. Z.
 SO Radiokhimiya, 25(1), 128-30
 PY 1983
- L10 ANSWER 15 OF 25
 TI The modeling of technetium ***extraction*** in uranium cycle of PUREX-type process
 AU Kadrabova, J.; Macasek, F.
 SO Acta Fac. Rerum Nat. Univ. Comenianae, Chim., 30, 55-63
 PY 1982
- L10 ANSWER 16 OF 25
 TI Quantitative description using linear relationships of free energies for a new set of anion-exchange ***extraction*** constants for a series of single-charged anions
 AU Shmidt, V. S.; Rybakov, K. A.; Rubisov, V. N.
 SO Zh. Neorg. Khim., 27(6), 1519-22
 PY 1982
- L10 ANSWER 17 OF 25
 TI The ***extraction*** of technetate(VI) ion and palladium(II) by dihexyl-N,N-diethylcarbamoylmethylphosphonate from nitric acid
 AU Mclsaac, L. D.
 SO Sep. Sci. Technol., 17(2), 387-405
 PY 1982

L10 ANSWER 18 OF 25
TI ***Extraction*** of pertechnetate,
molybdate, and
molybdophosphate ions by some oxygen-
containing solvents in acid
solution: a new procedure of production of
technetium-99m for
medical use
AU Misak, N. Z.; El-Asrag, H. A.; El-Kolaly,
M.; Hallaba, E.
SO Microchem. J., 26(3), 316-28
PY 1981

L10 ANSWER 19 OF 25
TI Simulation of interfacial two-step
consecutive reactions by
diffusion in the mass-transfer kinetics of
liquid-liquid
extraction of metal cations
AU Danesi, P. R.; Vandegrift, G. F.; Horwitz,
E. P.; Chiarizia, R.
SO J. Phys. Chem., 84(26), 3582-7
PY 1980

L10 ANSWER 20 OF 25
TI ***Extraction*** of pertechnetate anion
as a ligand in metal
complexes with tributylphosphate
AU Macasek, F.; Kadrabova, J.
SO J. Radioanal. Chem., 51(1), 97-106
PY 1979

L10 ANSWER 21 OF 25
TI ***Extraction*** of pertechnetate with
tri(alkyl)methylammonium
nitrates. Kinetics and mechanism in the
system o-xylene-nitric acid
AU Dyrkacz, Gary R.; Vandegrift, G. F.;
Thomsen, M. W.; Horwitz, E. P.
SO J. Phys. Chem., 83(6), 670-5
PY 1979

L10 ANSWER 22 OF 25
TI ***Extraction*** of technetium(VII) from
nitrate solutions by
tri-n-octylamine solutions
AU Volk, V. I.; Rozen, A. M.; Barabash, A. I.
SO Radiokhimiya, 18(2), 243-6
PY 1976

L10 ANSWER 23 OF 25
TI Organic oxides as ***extractants*** for
metal anions
AU Krasovec, F.; Klofutar, C.
SO Solvent Extr. Chem., Proc. Int. Conf.,
Goteborg, Volume Date 1966
509-16
PY 1967

L10 ANSWER 24 OF 25
TI Properties of anions controlling the
extractability of
their associates with triarylmethane dyes
AU Lomonosov, S. A.; Nikolaev, A. V.

SO Zh. Strukt. Khim., 8(2), 216-20
PY 1967

L10 ANSWER 25 OF 25
TI Solvent ***extraction*** and
spectrophotometric determination of
the pertechnetate ion with Methyl Violet
AU Fujinaga, Taitiro; Koyama, Mutsuo;
Kanchiku, Yoshihiko; Tsurubo,
Shigeo
SO Bull. Chem. Soc. Jpn., 40(4), 817-21
PY 1967

CAS Online Search, April 1994

CAS Online Search 5/11/94

=> s 14333-24-5 and extract? and 1993-1994/py
396 14333-24-5
88662 EXTRACT?
488590 1993-1994/PY

L1 1 14333-24-5 AND EXTRACT? AND
1993-1994/PY

=> d 11

L1 ANSWER 1 OF 1 CA
AN CA119(18):189552w CA
TI Solvent ***extraction*** of rhenium(VII)
with crown ethers and
some univalent cations
AU Zhang, Xianxin; Zhou, Zhixian; Ma,
Shejun; Shu, Chang
CS Dep. Chem., Zhengzhou Univ.
LO Zhengzhou 450052, Peop. Rep. China
SO Solvent Extr. Ion Exch., 11(4), 585-601
SC 68-2 (Phase Equilibriums, Chemical
Equilibriums, and Solutions)
SX 69
DT J
CO SEIEDB
IS 0736-6299
PY 1993
LA Eng

=> s 14333-20-1 and extract? and 1993-1994/py
not l1

317 14333-20-1
88662 EXTRACT?
488590 1993-1994/PY

L2 1 14333-20-1 AND EXTRACT? AND
1993-1994/PY NOT L1

=> d l2

L2 ANSWER 1 OF 1 CA
AN CA120(6):64219g CA
TI ***Extraction*** of technetium(VII) from
uranium(VI) in nitric
acid system by primary amine - n-heptane
solution

AU Ito, K.
CS Inst. Adv. Mater. Process., Tohoku Univ.
LO Sendai 980, Japan
SO J. Radioanal. Nucl. Chem., 171(2), 371-82
SC 71-5 (Nuclear Technology)
DT J
CO JRNCMD
IS 0236-5731
PY 1993
LA Eng

=> s rhenium and recovery and 1993-1994/py
15500 RHENIUM
101858 RECOVERY
488590 1993-1994/PY

L3 13 RHENIUM AND RECOVERY AND
1993-1994/PY

=> d l3 1-13

L3 ANSWER 1 OF 13 CA
AN CA120(12):146794e CA
TI ***Recovery*** and mutual separation
process of fission-produced
noble metals(II) - dissolution of the
simulated fission-produced
noble metal alloys (molybdenum-
rhenium -ruthenium-rhodium-
palladium alloys) in boiling nitric acid
solution

AU Matsui, Tsuneo; Sasaki, Ryoichi
CS Dep. Nucl. Eng., Nagoya Univ.
LO Nagoya 464-01, Japan
SO Proc. Int. Conf. Technol. Expo. Future Nucl.
Syst.: Emerging Fuel
Cycles Waste Disposal Options, Volume 2,
1018-24. Am. Nucl. Soc.:
La Grange Park, Ill.
SC 71-11 (Nuclear Technology)
SX 56
DT C
CO 59PFAE
PY 1993
LA Eng

L3 ANSWER 2 OF 13 CA
AN CA120(12):142854b CA
TI Wet precipitator case histories

AU Ojanpera, R.; Gamble, B.
CS Joy Technol. Canada Inc.
LO Kitchener, ON N2C 2C8, Can.
SO Mater. Process. Technol. Environ. Prot. Min.
Metall., Proc. Int.

Symp., 457-71. Edited by: Godbehere, P. W.
Can. Inst. Min. Metall.
Pet.: Montreal, Can.

SC 59-4 (Air Pollution and Industrial Hygiene)
SX 47, 54, 56
DT C
CO 59ODA3
PY 1993
LA Eng

L3 ANSWER 3 OF 13 CA
AN CA120(12):139827q CA
TI Advanced materials extraction needed for
new materials production
AU Davidson, Charles F.; Harbuck, Donna D.;
Redden, Lorin D.

CS Salt Lake City Res. Cent., Bur. Mines
LO Salt Lake City, UT 84108, USA
SO Int. Conf. Process. Mater. Prop., 1st, 417-20.
Edited by: Henein,
Hani; Oki, Takeo. Miner. Met. Mater. Soc:
Warrendale, Pa.

SC 54-2 (Extractive Metallurgy)
DT C
CO 59TDAS
PY 1993
LA Eng

L3 ANSWER 4 OF 13 CA
AN CA120(6):59231a CA
TI Process for simultaneous ***recovery*** of
precious metals and
tertiary phosphine from spent catalysts using
tellurium
IN De Oliveira, Bandarra Joao J.; De
Carvalho, Alexandre J. G.; Heggie,
William

PA Plurichemie Anstalt
LO Liechtenstein
SO Can. Pat. Appl., 9 pp.
PI CA 2086384 AA 930701
AI CA 92-2086384 921229
PRAI PT 91-99958 911231
PT 91-99959 911231
SC 54-4 (Extractive Metallurgy)
SX 49, 51
DT P
CO CPXXEB
PY 1993
LA Eng

L3 ANSWER 5 OF 13 CA
AN CA120(6):57801n CA
TI ***Recovery*** of ***rhenium*** from
nonferrous metallurgy
wastes
IN Mordalski, Jerzy; Lach, Jan; Szmygin,
Marian; Banas, Boleslaw;
Czarny, Joanna; Kowal, Witold
PA KGHM "Polska miedz" - SA. Oddzial-
Zaklad Doswiadczalny
LO Pol.
SO Pol., 12 pp. Abstracted and indexed from
the unexamined application.
PI PL 160950 B1 930531
AI PL 88-273322 880624
SC 49-1 (Industrial Inorganic Chemicals)
SX 55
DT P
CO POXXA7
PY 1993
LA Pol

L3 ANSWER 6 OF 13 CA
AN CA120(4):33815u CA
TI Radiochemical separation of thallium(I)
using cerium(IV) molybdate
as an ion exchanger
AU Bhagat, R. D.; Turel, Z. R.
CS Nucl. Chem. Div., Inst. Sci.
LO Bombay 400032, India
SO Sep. Sci. Technol., 29(5), 663-9
SC 49-1 (Industrial Inorganic Chemicals)
SX 66, 68, 71, 78, 79
DT J
CO SSTEDS
IS 0149-6395
PY 1994
LA Eng

L3 ANSWER 7 OF 13 CA
AN CA120(2):22699h CA
TI A procedural modification for enhanced
recovery of
precious metals (gold, platinum group
elements) following nickel
sulfide fire assay and tellurium co-
precipitation: applications for
analysis of geological samples by inductively
coupled plasma mass
spectrometry
AU Sun, Min; Jain, Jinesh; Zhou, Meifu;
Kerrich, Robert
CS Dep. Geol. Sci., Univ. Saskatchewan
LO Saskatoon, SK S7N 0W0, Can.
SO Can. J. Appl. Spectrosc., 38(4), 103-8
SC 79-6 (Inorganic Analytical Chemistry)
SX 53
DT J
CO CJSPEM
PY 1993
LA Eng

L3 ANSWER 8 OF 13 CA
AN CA119(26):275600s CA

TI Reclamation of tungsten from activated
fusion reactor components
AU Murphy, D.; Warren, S.; Butterworth, G. J.
CS Johnson Matthey plc
LO Royston, Hertfordshire, SG8 5HE, UK
SO Fusion Eng. Des., 22(4), 379-92
SC 54-2 (Extractive Metallurgy)
SX 71
DT J
CO FEDEEE
IS 0920-3796
PY 1993
LA Eng

L3 ANSWER 9 OF 13 CA
AN CA119(18):185191e CA
TI Geochemical prospecting by selective
leaching followed by
quantitative analysis
IN Clark, John Robert
LO USA
SO PCT Int. Appl., 60 pp.
PI WO 9309223 A1 930513
DS W: AU, BR, CA, FI, NO, RU
RW: AT, BE, CH, DE, DK, ES, FR, GB, GR,
IE, IT, LU, MC, NL, SE
AI WO 92-US8732 921013
PRAI US 91-788543 911106
SC 53-2 (Mineralogical and Geological
Chemistry)
DT P
CO PIXXD2
PY 1993
LA Eng

L3 ANSWER 10 OF 13 CA
AN CA119(16):163796d CA
TI ***Recovery*** of hydrocarbons from
contaminated or waste
petroleum and petroleum products by using a
surface-treated
permeable inorganic membrane
IN Sleppy, William C.; Wieserman, Larry F.;
Thomas, Kenneth M.;
Goodboy, Kenneth P.
PA Aluminum Co. of America
LO USA
SO U.S., 8 pp.
PI US 5209838 A 930511
AI US 91-772205 911007
SC 51-2 (Fossil Fuels, Derivatives, and
Related Products)
SX 60
DT P
CO USXXAM
PY 1993
LA Eng

L3 ANSWER 11 OF 13 CA
AN CA119(2):13368b CA
TI Inclusions of the .CHI.-phase and structural
recovery in
ternary nickel-titanium based alloys
AU Khundzhua, A. G.; Sorokin, A. V.
CS Mosk. Gos. Univ.
LO Moscow, Russia
SO Izv. Akad. Nauk, Ser. Fiz., 57(2), 117-19
SC 56-8 (Nonferrous Metals and Alloys)
DT J
CO IRAFEO
PY 1993
LA Russ

L3 ANSWER 12 OF 13 CA
AN CA118(26):260509z CA
TI Metal ***recovery*** from waste
catalysts used in exhaust gas
treatment
IN Giegerich, Heinz; Hensel, Clemens
PA EAR European Autocat Recycling GmbH
LO Germany
SO Ger. Offen., 7 pp.
PI DE 4122717 A1 930121
AI DE 91-4122717 910709
SC 60-4 (Waste Treatment and Disposal)
SX 51, 54, 59, 67
DT P
CO GWXXBX
PY 1993
LA Ger

L3 ANSWER 13 OF 13 CA
AN CA118(22):217007x CA
TI Selective ***recovery*** of
rhenium from gas-scrubbing
solutions of molybdenite roasting using direct
precipitation and
separation on resins
AU Blazy, P.; Jdid, E. A.; Floreancig, A.;
Mottet, B.
CS Cent. Recher. sur la Valorisation Miner.,
ENSG
LO Vandoeuvre 54501, Fr.
SO Sep. Sci. Technol., 28(11), 2073-96
SC 54-2 (Extractive Metallurgy)
DT J
CO SSTEDS
IS 0149-6395
PY 1993
LA Eng

=> s technetium and recovery and 1993-1994/py
8108 TECHNETIUM
101858 RECOVERY
488590 1993-1994/PY
L4 8 TECHNETIUM AND RECOVERY
AND 1993-1994/PY

=> d l4 1-8

L4 ANSWER 1 OF 8 CA
AN CA120(16):202710p CA

TI Method and apparatus for concentration and
purification of
pertechnetate-99mTc solutions
IN Seifert, Sepp; Schneider, Frauke; Wagner,
Gerhard
PA Forschungszentrum Rossendorf E.V.; Verein
fuer Kernverfahrenstechnik
und Analytik E.V.
LO Germany
SO Ger. Offen., 5 pp.
PI DE 4229327 A1 940303
AI DE 92-4229327 920902
SC 71-6 (Nuclear Technology)
DT P
CO GWXXBX
PY 1994
LA Ger

L4 ANSWER 2 OF 8 CA
AN CA120(16):202625q CA
TI ***Recovery*** of ***technetium***
from high-level liquid
waste generated in nuclear fuel reprocessing
AU Kubota, Masumitsu
CS Dep. Chem. Fuel Res., Japan At. Energy
Res. Inst.
LO Tokai 319-11, Japan
SO Radiochim. Acta, 63, 91-6
SC 71-11 (Nuclear Technology)
DT J
CO RAACAP
IS 0033-8230
PY 1993
LA Eng

L4 ANSWER 3 OF 8 CA
AN CA120(12):146804h CA
TI Advanced chemical separations in support
of the Clean Option
Strategy
AU Horwitz, E. Philip; Dietz, Mark L.;
Diamond, Herbert; Rogers, Robin
D.; Leonard, Ralph A.
CS Chem. Div., Argonne Natl. Lab.
LO Argonne, IL 60439-4831, USA
SO Proc. Int. Conf. Technol. Expo. Future Nucl.
Syst.: Emerging Fuel
Cycles Waste Disposal Options, Volume 1,
39-43. Am. Nucl. Soc.: La
Grange Park, Ill.
SC 71-11 (Nuclear Technology)
DT C
CO 59PFAE
PY 1993
LA Eng

L4 ANSWER 4 OF 8 CA
AN CA120(2):17401a CA
TI Production of fission-product molybdenum
from irradiated
low-enriched uranium for use in nuclear
medicine
AU Sameh, A. A.
CS HZY
LO Germany
SO KFK-Nachr., 25(2), 83-9
SC 71-6 (Nuclear Technology)
DT J
CO KFKNAW
IS 0340-756X
PY 1993
LA Ger

L4 ANSWER 5 OF 8 CA
AN CA119(24):258292a CA
TI Separation and ***recovery*** of Tc from
radioactive waste
solutions
IN Imoto, Yoshe; Mikura, Michitaka
PA Tokyo Shibaura Electric Co
LO Japan
SO Jpn. Kokai Tokkyo Koho, 10 pp.
PI JP 05100085 A2 930423 Heisei
AI JP 91-259144 911007
SC 71-11 (Nuclear Technology)
DT P
CO JKXXAF
PY 1993
LA Japan

L4 ANSWER 6 OF 8 CA
AN CA119(20):212719s CA
TI ***Recovery*** of ***technetium***
with active carbon column
in partitioning process of high-level liquid
waste
AU Yamagishi, Isao; Kubota, Masumitsu
CS Japan At. Energy Res. Inst.
LO Tokai 319-11, Japan
SO J. Nucl. Sci. Technol., 30(7), 717-19
SC 71-11 (Nuclear Technology)
SX 66
DT J
CO JNSTAX
IS 0022-3131
PY 1993
LA Eng

L4 ANSWER 7 OF 8 CA
AN CA119(16):163796d CA
TI ***Recovery*** of hydrocarbons from
contaminated or waste
petroleum and petroleum products by using a
surface-treated
permeable inorganic membrane
IN Sleppy, William C.; Wieserman, Larry F.;
Thomas, Kenneth M.;
Goodboy, Kenneth P.
PA Aluminum Co. of America
LO USA

SO U.S., 8 pp.
PI US 5209838 A 930511
AI US 91-772205 911007
SC 51-2 (Fossil Fuels, Derivatives, and
Related Products)
SX 60
DT P
CO USXXAM
PY 1993
LA Eng

L4 ANSWER 8 OF 8 CA
AN CA119(11):112388q CA
TI Optimizing the ***recovery*** of
chemically reduced monoclonal
antibody for site-specific ***technetium***
-99m radiolabeling
AU Boonkitticharoen, V.; James, H.; Cheung,
N. K. V.; Larson, S. M.;
Finn, R. D.
CS Dep. Med. Phys., Mem. Sloan-Kettering
LO New York, NY 10021, USA
SO BioTechniques, 14(5), 706, 708
SC 8-9 (Radiation Biochemistry)
SX 14
DT J
CO BTNQDO
IS 0736-6205
PY 1993
LA Eng

=> s 14333-24-5 and 1993-1994/py
396 14333-24-5
488590 1993-1994/PY

L5 8 14333-24-5 AND 1993-1994/PY

=> s 15 not 11
L6 7 L5 NOT L1

=> d 16 1-7

L6 ANSWER 1 OF 7 CA
AN CA120(8):94132r CA
TI Novel coated wire ion selective electrodes
for estimation of
perrhenate ion
AU Agarwala, V.; Chattopadhyaya, M. C.
CS Electrochem. Sensors Lab., Univ.
Allahabad
LO Allahabad 211002, India
SO Analisis, 21(8), 349-52
SC 79-2 (Inorganic Analytical Chemistry)
SX 72
DT J
CO ANLSCY
IS 0365-4877
PY 1993
LA Eng

L6 ANSWER 2 OF 7 CA
AN CA120(4):44737w CA
TI Ion-selective electrode for determining
perrhenate ions in
molybdenum-containing solutions
IN Babenko, Nadezhda L.; Blokh, M. Sh.;
Tashuta, Galina N.
PA Institute of Metallurgy and Ore
Benefication, Academy of Sciences,
KazakhS.S.R.
LO USSR
SO U.S.S.R. From: Izobreteniya 1993, (3), 228.
PI SU 1790764 A3 930123
AI SU 90-4814925 900416
SC 79-2 (Inorganic Analytical Chemistry)
DT P
CO URXXAF
PY 1993
LA Russ

L6 ANSWER 3 OF 7 CA
AN CA120(4):38598k CA
TI Electronic structures of d0 complexes by the
DV-X.alpha. method
AU Mukoyama, Takeshi; Adachi, Hirohiko
CS Institute for Chemical Research, Kyoto
University, Uji
LO Kyoto 611, Japan
SO Chem. Phys. Lett., 215(1-3), 93-6
SC 65-3 (General Physical Chemistry)
DT J
CO CHPLBC
IS 0009-2614
PY 1993
LA Eng

L6 ANSWER 4 OF 7 CA
AN CA119(21):224277j CA
TI Selective alteration of antibody
immunogenicity
IN Sykes, Thomas R.; Reddish, Mark; Baum,
Richard P.; Noujaim, Antoine
A.
PA Biomira Inc.
LO Can.
SO PCT Int. Appl., 32 pp.
PI WO 9318792 A1 930930
DS W: AU, CA, FI, JP, NO, US
RW: AT, BE, CH, DE, DK, ES, FR, GB, GR,
IE, IT, LU, MC, NL, PT, SE
AI WO 93-CA110 930318
PRAI US 92-853605 920318
SC 15-3 (Immunochemistry)
DT P
CO PIXXD2
PY 1993
LA Eng

L6 ANSWER 5 OF 7 CA
AN CA119(12):126213r CA
TI Heat capacities of tetrahedral oxoanions in
aqueous solutions at 298
K
AU Drakin, S. I.; Popova, O. V.

CS Mosk. Khim.-Tekhnol. Inst.
LO Moscow, Russia
SO Zh. Fiz. Khim., 67(3), 606-8
SC 69-2 (Thermodynamics, Thermochemistry,
and Thermal Properties)
SX 68
DT J
CO ZFKHA9
IS 0044-4537
PY 1993
LA Russ

L6 ANSWER 6 OF 7 CA
AN CA118(22):215319b CA
TI Highly selective monoalkylene glycol
catalysts
IN Forkner, Matthew William
PA Union Carbide Chemicals and Plastics
Technology Corp.
LO USA
SO Eur. Pat. Appl., 17 pp.
PI EP 529726 A1 930303
DS R: BE, DE, ES, FR, GB, IT, NL
AI EP 92-202570 920821
PRAI US 91-749332 910823
SC 45-4 (Industrial Organic Chemicals,
Leather, Fats, and Waxes)
SX 67
DT P
CO EPXXDW
PY 1993
LA Eng

L6 ANSWER 7 OF 7 CA
AN CA118(16):157019r CA
TI Raman spectra, absolute Raman intensities,
and electrooptical
parameters of pertechnetate, perrhenate,
and periodate ions in
aqueous solution
AU Eysel, Hans H.; Kanellakopoulos, Basil
CS Anorg.-Chem. Inst., Univ. Heidelberg
LO Heidelberg 6900/1, Germany
SO J. Raman Spectrosc., 24(2), 119-22
SC 73-3 (Optical, Electron, and Mass
Spectroscopy and Other Related
Properties)
SX 78
DT J
CO JRSPAF
IS 0377-0486
PY 1993
LA Eng

=> s 14333-20-1 and 1993-1994/py not l2
317 14333-20-1
488590 1993-1994/PY
L7 10 14333-20-1 AND 1993-1994/PY NOT
L2

=> d 17 1-10

L7 ANSWER 1 OF 10 CA
AN CA120(16):202710p CA
TI Method and apparatus for concentration and purification of pertechnetate-99mTc solutions
IN Seifert, Sepp; Schneider, Frauke; Wagner, Gerhard
PA Forschungszentrum Rossendorf E.V.; Verein fuer Kernverfahrenstechnik und Analytik E.V.
LO Germany
SO Ger. Offen., 5 pp.
PI DE 4229327 A1 940303
AI DE 92-4229327 920902
SC 71-6 (Nuclear Technology)
DT P
CO GWXXBX
PY 1994
LA Ger

L7 ANSWER 2 OF 10 CA
AN CA120(16):201370r CA
TI Adsorption of pertechnetate on an anion exchange resin
AU Kawasaki, Mikio; Omori, Takashi; Hasegawa, Kunihiko
CS Radiochem. Res. Lab., Shizuoka Univ.
LO Shizuoka 422, Japan
SO Radiochim. Acta, 63, 53-6
SC 66-4 (Surface Chemistry and Colloids)
SX 71, 79
DT J
CO RAACAP
IS 0033-8230
PY 1993
LA Eng

L7 ANSWER 3 OF 10 CA
AN CA120(14):176023v CA
TI Partitioning of actinides from acid waste solutions of Purex origin using CMPO
AU Mathur, J. N.; Murali, M. S.; Iyer, R. H.; Ramanujam, A.; Dhama, P.
S.; Gopalakrishnan, V.; Badheka, L. P.; Banerji, A.
CS Radiochem. Div., Bhadha At. Res. Cent.
LO Bombay 400085, India
SO Proc. Int. Conf. Technol. Expo. Future Nucl. Syst.: Emerging Fuel Cycles Waste Disposal Options, Volume 1, 601-6. Am. Nucl. Soc.: La Grange Park, Ill.
SC 71-11 (Nuclear Technology)
DT C
CO 59PFAE

PY 1993
LA Eng

L7 ANSWER 4 OF 10 CA
AN CA120(5):49593f CA
TI Ligands for improved macromolecule radiolabeling
IN Bridger, Gary James; Hernandez, Pedro Emilio; Higgins, John David III; Larsen, Scott Kenneth
PA Johnson Matthey PLC
LO UK
SO Eur. Pat. Appl., 13 pp.
PI EP 569132 A1 931110
DS R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, NL, PT, SE
AI EP 93-302712 930407
PRAI GB 92-9641 920502
SC 9-14 (Biochemical Methods)
SX 8, 15, 23, 78
DT P
CO EPXXDW
PY 1993
LA Eng
OS MARPAT 120:49593

L7 ANSWER 5 OF 10 CA
AN CA120(4):38598k CA
TI Electronic structures of d0 complexes by the DV-X.alpha. method
AU Mukoyama, Takeshi; Adachi, Hirohiko
CS Institute for Chemical Research, Kyoto University, Uji
LO Kyoto 611, Japan
SO Chem. Phys. Lett., 215(1-3), 93-6
SC 65-3 (General Physical Chemistry)
DT J
CO CHPLBC
IS 0009-2614
PY 1993
LA Eng

L7 ANSWER 6 OF 10 CA
AN CA119(23):245192t CA
TI Accumulation of technetium by cyanobacteria
AU Garnham, Geoffrey W.; Codd, Geoffrey A.; Gadd, Geoffrey M.
CS Dep. Biol. Sci., Univ. Dundee
LO Dundee DD1 4HN, UK
SO J. Appl. Phycol., 5(3), 307-15
SC 10-2 (Microbial, Algal, and Fungal Biochemistry)
DT J
CO JAPPEL
IS 0921-8971
PY 1993
LA Eng

L7 ANSWER 7 OF 10 CA
AN CA119(21):224277j CA
TI Selective alteration of antibody immunogenicity
IN Sykes, Thomas R.; Reddish, Mark; Baum, Richard P.; Noujaim, Antoine
A.
PA Biomira Inc.
LO Can.
SO PCT Int. Appl., 32 pp.
PI WO 9318792 A1 930930
DS W: AU, CA, FI, JP, NO, US
RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
AI WO 93-CA110 930318
PRAI US 92-853605 920318
SC 15-3 (Immunochemistry)
DT P
CO PIXXD2
PY 1993
LA Eng

L7 ANSWER 8 OF 10 CA
AN CA119(6):58044j CA
TI The role of oxygen diffusion in the release of technetium from reducing cementitious waste forms
AU Smith, Robert W.; Walton, John C.
CS Idaho Natl. Eng. Lab.
LO Idaho Falls, ID 83415, USA
SO Mater. Res. Soc. Symp. Proc., 294(Scientific Basis for Nuclear Waste Management XVI), 247-53
SC 71-11 (Nuclear Technology)
SX 58
DT J
CO MRSPDH
IS 0272-9172
PY 1993
LA Eng

L7 ANSWER 9 OF 10 CA
AN CA118(16):157019r CA
TI Raman spectra, absolute Raman intensities, and electrooptical parameters of pertechnetate, perrhenate, and periodate ions in aqueous solution
AU Eysel, Hans H.; Kanellakopoulos, Basil
CS Anorg.-Chem. Inst., Univ. Heidelberg
LO Heidelberg 6900/1, Germany
SO J. Raman Spectrosc., 24(2), 119-22
SC 73-3 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
SX 78
DT J
CO JRSPAF
IS 0377-0486
PY 1993
LA Eng

L7 ANSWER 10 OF 10 CA
AN CA118(8):68680g CA

TI Technetium-99 removal from process solutions and contaminated groundwater
AU Del Cul, G. D.; Bostick, W. D.; Trotter, D. R.; Osborne, P. E.
CS Dep. Chem., Oak Ridge K-25 Site
LO Oak Ridge, TN 37831-7274, USA
SO Sep. Sci. Technol., 28(1-3), 551-64
SC 71-11 (Nuclear Technology)
SX 61, 66
DT J
CO SSTEDS
IS 0149-6395
PY 1993
LA Eng

=> s 14333-20-1 and environment? and 1993-1994/py
317 14333-20-1
81746 ENVIRONMET?
488590 1993-1994/PY
L8 0 14333-20-1 AND ENVIRONMENT?
AND 1993-1994/PY

=> s 14333-20-1 and separat? and 1993-1994/py
317 14333-20-1
100163 SEPARAT?
488590 1993-1994/PY
L9 0 14333-20-1 AND SEPARAT? AND
1993-1994/PY