# NEUTRON ACTIVATION ANALYSIS OF SOME HIGH PURITY SUBSTANCES

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Abstract: $CaF_2$, $GeO_2$, $Bi_2O_3$ and $(NH_4)_2MoO_4.4H_2O$ of high purity have been analysed by INAA. Trace elements Ag, Au, As, Br, Co, Cs, Fe, Na, Rb, Sb, Sc, Sr, Zn at ppm and ppb level were determined.

## INTRODUCTION

It is important to know the trace element contents in some samples in order to get high purity materials needed by various domains of research and technology. Impurity levels of 1-50 ppm are considered for these substances. The first three of above analysed substances were obtained in the Institute for Physics and Technology of Materials.

$CaF_2$ is used in growing crystal processes. These crystals have applications in many domains of optics (infrared instrumentation windows for gas - analyser, LASER media, etc.). $GeO_2$ and $Bi_2O_3$ of high purity were prepared to be utilised in the process of growing 6 $Bi_2O_3.GeO_2$ crystals with piezoelectric properties and also 2 $Bi_2O_3.3\ GeO_2$ having scintillation properties.

$(NH_4)_2MoO_4.4\ H_2O$ of high purity was analysed since it is used as a reactive agent in the trace analysis of P and Si. It is also used in obtaining lead molibdatum of which piezoelectric crystals are grown.

## EXPERIMENTAL

The powder samples (30 mg in weight) packed in aluminum foils were irradiated for 26 hours in a $1.4 \times 10^{13} n/cm^2.s$. flux. Soil-5 and Au (0.105 µg) were used as standards. The samples were transfered after irradiation in clean vials to be measured. The measurements of 3-5 hours were performed using a Ge(Li) detector protected by lead after 5, 19, 40 days cooling time. Fragments of the gamma spectra registered for the analysed substances are shown in figures 1, 2, 3, 4. The trace elements found are Au, Ag, As, Br, Co, Cs, Fe, Na, Rb, Sb, Sc, Sr, Zn. The background contribution in the Co determination was taken into account.

## RESULTS AND DISCUSSION

The concentration values of the investigated trace elements are presented in table 1.

TABLE I

| Element | Concentration (ppm) | | | |
|---|---|---|---|---|
| | $CaF_2$ | $GeO_2$ | $Bi_2O_3$ | $(NH_4)_2MoO_4.4H_2O$ |
| Au(ppb) | - | 0.9±0.2 | - | - |
| Ag | - | 0.05±0.01 | - | - |
| As | - | - | 0.12±0.02 | - |
| Br | - | - | 0.10±0.03 | - |
| Co(ppb) | 1.8±1.0 | 0.9±0.6 | 0.5±0.3 | 7±2 |
| Cs(ppb) | - | 2±1 | - | 470±30 |
| Fe | < 2 | 1.9±0.6 | 1.1±0.6 | < 2 |
| Na | - | 19±2 | 0.5±0.2 | - |
| Rb | - | - | - | 2.4±0.3 |
| Sb | - | - | - | 0.10±0.02 |
| Sc(ppb) | - | 0.15±0.06 | - | - |
| Sr | 8±3 | - | - | - |
| Zn | - | 0.04±0.03 | 0.04±0.02 | 0.4±0.1 |

The low level of the impurities content reflects a high purity of the analysed substances and their use in the research and technology domains above mentioned is recommended.

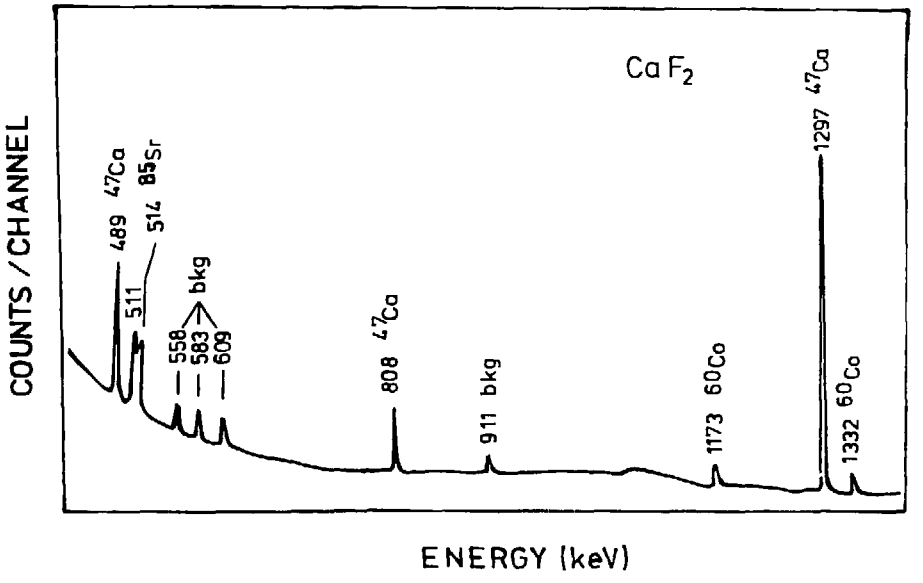


**Figure 1**

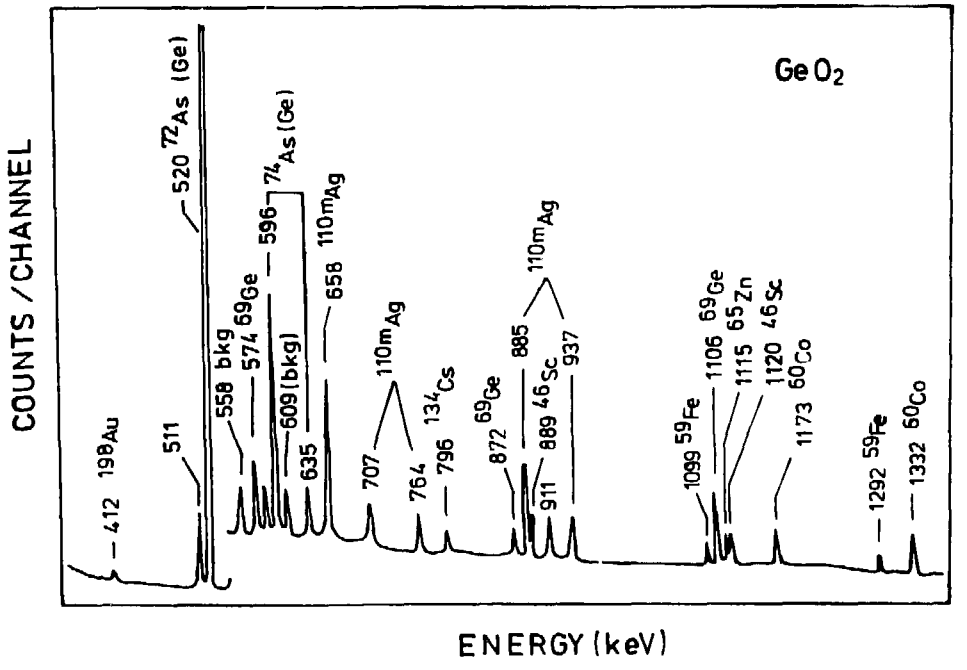


**Figure 2**

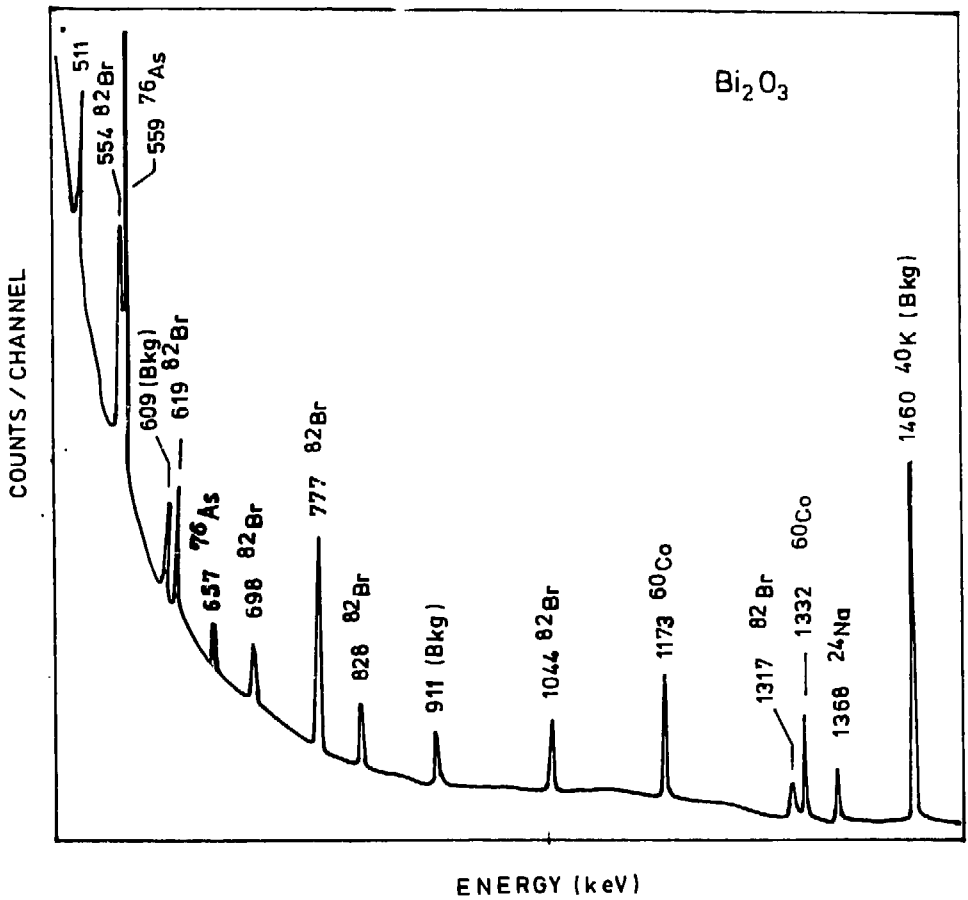


**Figure 3**

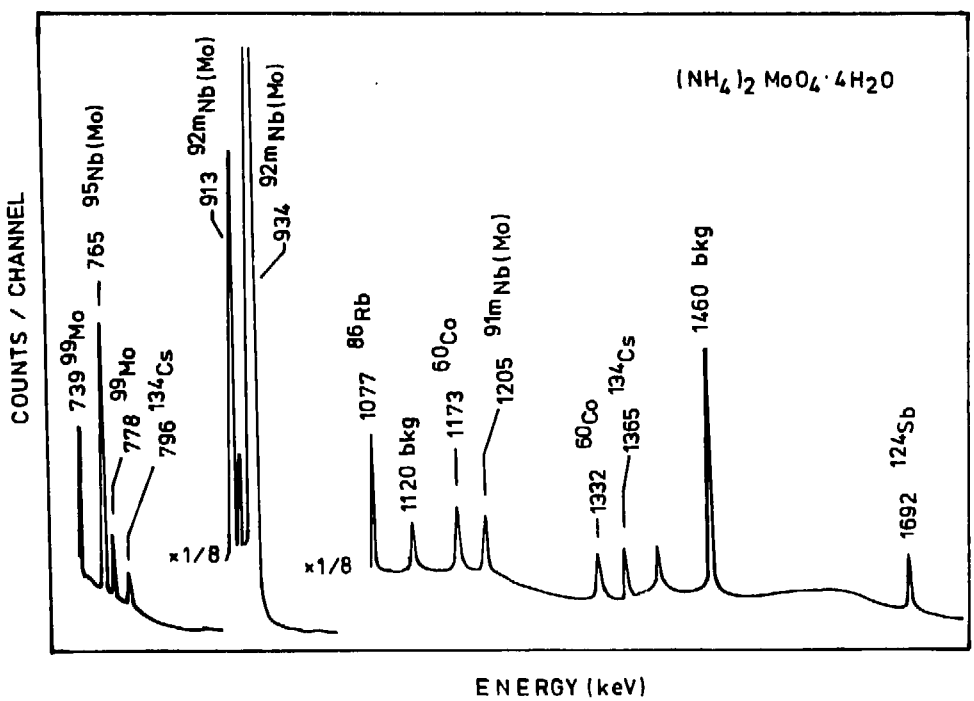


**Figure 4**