molecule in the adjacent layer via a hydrogen bond [d=2.677(11) Å] constituting the interlayer links. The bond distances and angles in the molecule of the title compound are in fair agreement with those observed in pyrazine-2,3-dicarboxylic acid dihydrate [3] and pyrazine-2,5-dicarboxylic acid dihydrate [1]. The symmetry of the title compound is monoclinic, space group C2/m.

X-ray diffraction measurements were carried out using the KUMA KM4 four circle diffractomer at this Institute. Data processing and structure refinement was performed using SHELXL program package [4].

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CRYSTAL CHEMISTRY OF COORDINATION COMPOUNDS WITH HETEROCYCLIC CARBOXYLATE LIGANDS. PART XXXIX: THE CRYSTAL AND MOLECULAR STRUCTURE OF A STRONTIUM(II) COMPLEX WITH PYRAZINE-2,6-DICARBOXYLATE AND WATER LIGANDS

Halina Ptasiewicz-Bąk, Janusz Leciejewicz

The crystals of $Sr_4(2,6\text{-}PZDC)_4(H_2O)_{14}\cdot 3H_2O$ catena-tetraqua {[hexaquabis(μ-pyrazine-2,6-dicarboxylato-O,O') distrontium(II)] [tetraquabis(μ-pyrazine-2,6-dicarboxylato-O,O') distrontium(II)]}trihydrate are triclinic, space group P1. Two types of symmetry independent dimeric structural units composed of two Sr(II) ions, two ligand molecules and water molecules are bridged by a pair of water molecules which simultcously are coordinated to the metal ions in the adjacent dimers. In both types of the dimers the Sr(II) ions are bridged by two carboxylate oxygen atoms, each acting in the bidentate mode, donated by a different ligand. The metal ion is also coordinated by one hetero ring nitrogen atom, one carboxylate oxygen atom and five water molecules in one dimer and two water molecules in the other. Two of the water molecules attached to each Sr(II) ion are bridging the dimers into an infinite molecular ribbon. Figure shows a fragment of this molecular ribbons. The coordination numbers of the Sr(II) ions in the first and second type dimers are nine and eight, respectively. Solvation water

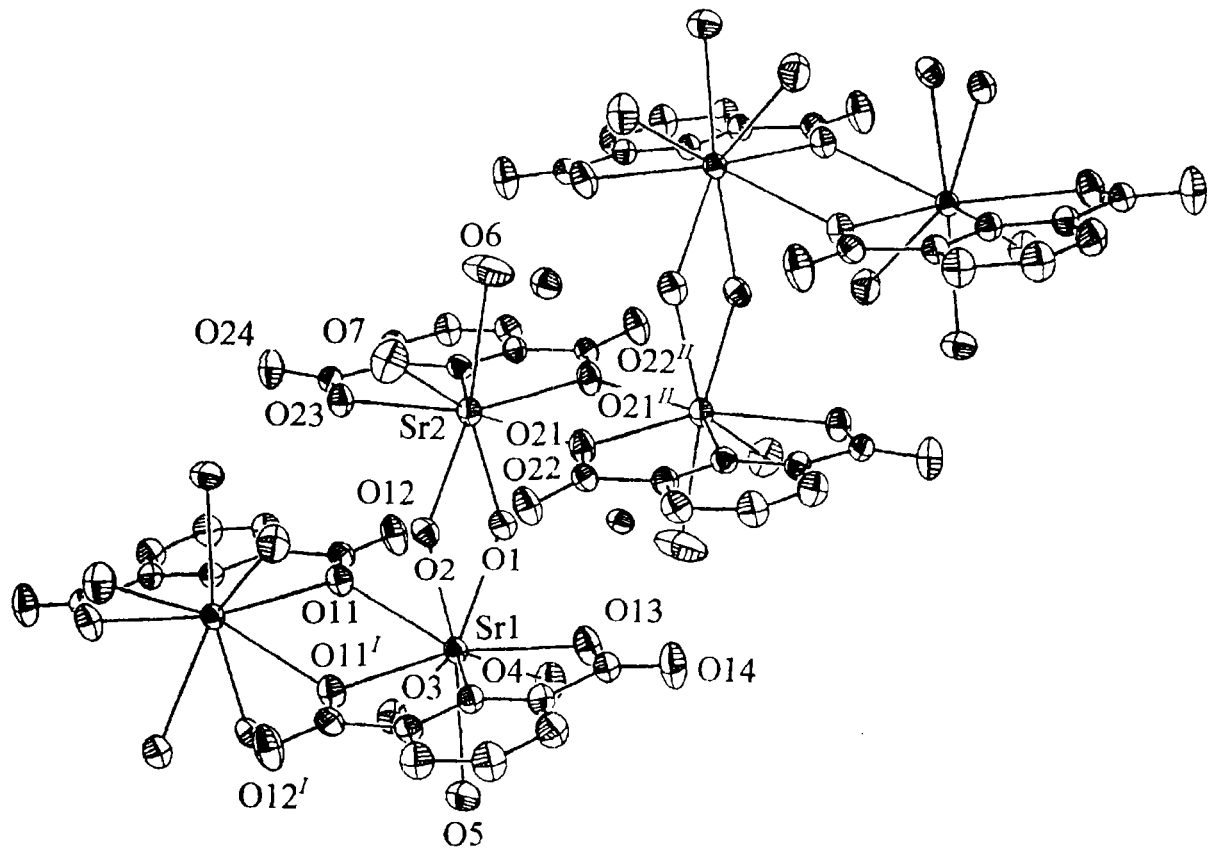

Fig. A fragment of the molecular ribbon containing two dimeric units with different coordination around the Sr ions.

molecules, the coordinated water molecules and the carboxylate oxygen atoms take part in an extended system of hydrogen bonds.

X-ray diffraction measurements were carried out using the KUMA KM4 four circle diffractomer at this Institute. Data processing and structure refinement was performed using SHELXL program package.

RADIOBIOLOGY

CHROMOSOMAL ABERRATIONS AND MICRONUCLEI IN LYMPHOCYTES OF FIVE BREAST CANCER PATIENTS FOLLOWING AN ACCIDENT DURING RADIOTHERAPY WITH 8 MeV ELECTRONS

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In February 2001 a radiation accident has occurred in a radiotherapy unit of a hospital in Poland. Due to a malfunction of a NEPTUN 10p accelerator, 5 breast cancer patients received a single, high dose of 8 MeV electrons. The patients were at various stages of therapy and received, prior to the accident, different tumor doses of both electrons and ^{60}Co radiation. In addition, with one exception, the patients received chemotherapy. Owing to various circumstances a precise reconstruction of the accident was not possible. Thus, the exact doses received during the accident are not known. However, based on the early and late skin reactions and a crude estimate of the medical physicist, they may have reached 100 Gy or higher.

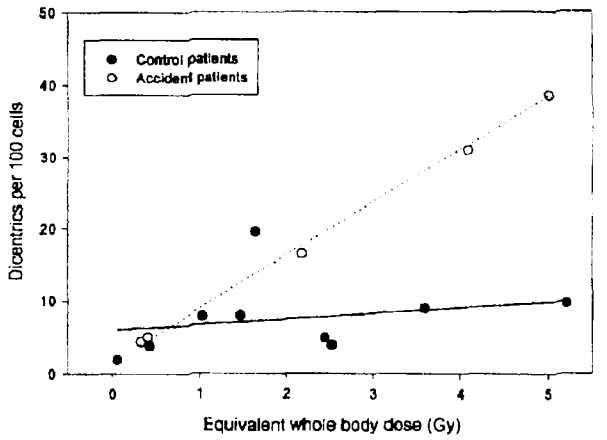

Fig. Frequencies of dicentrics in peripheral lymphocytes of patients irradiated during the accident and of control patients. The equivalent whole body doses are those received during regular radiotherapy.

In order to assess whether such a radiation exposure would be detectable in peripheral blood lymphocytes chromosomal aberrations and micronuclei were analyzed in lymphocytes of the accident patients and plotted against the equivalent whole body doses received prior to the accident. The results were compared to values of chromosomal aberrations and micronuclei of 10 control patients not involved in the accident, 9 of whom were treated in a different hospital but who received similar radiotherapy treatments.

The results of chromosomal aberration analysis are presented in Fig. It can be assumed that the differences in aberration frequencies between the control patients and the accident patients is due to the accident dose. In three of the accident patients more dicentrics were found than expected indicating that they received the highest accident doses. Similar results were observed for micronuclei.

MODELLING THE FREQUENCIES OF CHROMOSOMAL ABERRATIONS IN PERIPHERAL LYMPHOCYTES OF PATIENTS UNDERGOING RADIOTHERAPY

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Biological dosimetry based on the analysis of cytogenetic damage in peripheral lymphocytes of the exposed person is a well established technique [1]. The absorbed dose is estimated by comparing the scored number of aberrations with a calibration curve, obtained by in vitro irradiating of whole blood collected from a control person. Several authors have validated this procedure by testing experimentally that, after a uniform whole body exposure of animals, the frequency of aberrations induced by a given dose was essentially the same as that induced in vitro [2]. Also, Liniecki et al. [3] found a good agreement between results of in vitro irradiation of blood and partial-body irradiation of rabbits, when the in vivo exposure time was long enough for the whole peripheral blood to flow through the irradiated field. The calibration curves and the dose-response curves following in vivo irradiation are best fitted by a linear-quadratic equation [1].

Following partial-body exposure of a short duration the dose estimation becomes less precise because the cell population in a collected blood sample will be composed of irradiated and non-irradiated cells. Clearly, the imprecision is inversely related to the size of the exposed part of the body and the exposure time [3]. A situation where this problem is readily seen is the irradiation of patients during radiotherapy. The exposed part of the body is small and the exposure times are in the range of a minute. In addition, the total tumour dose is applied in fractions, usually of 2 Gy per day, 5 days a week.