MCC-3 538.24:546.11:546.16

Master of Science Thesis

Croat. Chem. Acta **36** (1964)

Proton and Fluorine Magnetic Resonance in Some Hydrated Crystals

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Proton and fluorine magnetic resonance spectra prove that the hydrates of zirconium tetrafluoride are correctly formulated as $ZrF_4 \cdot H_2O$ and $ZrF_4 \cdot 3H_2O$.

Van Vleck's second moment sum (of fluorine resonance) according to the crystal structure of the trihydrate proposed by Waters is in good agreement with the experimental results. This is consistent with the eightfold coordination of water molecules and fluorine atoms around zirconium.

It is found that 10—20 per cent surplus water is unavoidably incorporated into the crystal lattice of the monohydrate prepared by the usual methods. Pure monohydrate could be obtained by dehydrating $ZrF_4 \cdot 3H_2O$ at 110° C. This results in a definite change of the crystal structure and the bonding of the co-ordinating species around the zirconium atom.

Thesis was partly published: *J. Inorg. Nucl. Chem.* **25** (1963) 789.

Examiners: Dr. S. Maričić, Profesor D. Grdenić, Doc. C. Djordjević.

Oral examination: February 22, 1964.

Thesis deposited at the University Library and Institute »Ruđer Bošković«, Zagreb.

(52 pages, 12 figures, 25 references, original in Croatian)

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MCC-3

538.24:546.11:546.16

1. Proton and Fluorine Magnetic Resonance in Some Hydrated Crystals

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Fluorine
Hydrated crystals
Nuclear magnetic resonance
Proton
— , magnetic resonance
Zirconium

MCC-4 539.172.4:546.41:546.155-33

Master of Science Thesis

Croat. Chem. Acta **36** (1964)

Chemical Effects of Nuclear Reaction in the Thermal Neutron-Irradiated Calcium Iodate

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Thermal annealing of ^{128}I in neutron-irradiated calcium iodate was examined in the temperature range from 100° to 250°C. The increase in the retention was obtained as observed earlier with the products of Szilard-Chalmers reactions. The isotopic exchange of IO_3^- - I^- or (I_2) was also studied in the solid samples of $Ca(IO_3)_2$ labelled with $^{131}I^-$ by either coprecipitation or recrystallization. The heating of these samples at temperatures 170°—400°C showed the possibility of exchange of iodine atoms between the lower and the higher oxidation states.

The analysis of the bombarded and labelled samples were performed by precipitation of silver iodide after addition of carrier iodide in the presence of sufficient ammonia.

The results indicated that the kinetics of the process in a simulated system $Ca(IO_3)_2$ - ^{131}I is formally very similar to the kinetics of annealing in irradiated calcium iodate. Vand-Primak method of analysis of activation energy for the simulated systems also gave the value of approximately 1 ev which is in the same order of magnitude as obtained in the cases of annealing in the bombarded systems.

Finally, the results are discussed in view of the possibility that isotopic exchange reactions may participate in the processes of the return of the recoil atoms to the chemical form of the target under specific conditions of annealing.

Examiners: Doc. R. Wolf, Dr. M. Vlatković, Dr. P. Strohal

Oral examination: May 23, 1964.

Thesis deposited at the Central Chemical Library, Zagreb, and Institute »Ruđer Bošković«, Zagreb.

(51 pages, 11 figures, 60 references, original in Croatian)

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MCC-4

539.172.4:546.41:546.155-33

1. Chemical Effects of Nuclear Reaction in the Thermal Neutron-Irradiated Calcium Iodate

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Annealing
Calcium Iodate
Chemical Effects of Nuclear Reaction
Isotopic Exchange
Labelled Samples
Retention
Thermal Neutron-Irradiation