

DOCUMENTA CHEMICA YUGOSLAVICA

CROATICA  
CHEMICA ACTA

(ARHIV ZA KEMIJU)

**VOL. 34**

**PRILOG**

**Z A G R E B  
YUGOSLAVIA**

**1962**

*Croat. Chem. Acta*

# CROATICA CHEMICA ACTA

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19 Marulićev trg, Zagreb, Croatia, Yugoslavia

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541.28

*Croat. Chem. Acta* 34 (1962)**Chemical States of Radiohalogens Formed by Nuclear Reactions in Solids**

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The thesis deals with the chemical effects of nuclear transformations induced in inorganic and partly in organic solids. The influence of the chemical constitution of target compounds, their treatment before and after the irradiation, the method of separation of stable chemical species are studied with regard to the chemical distribution of radiohalogens between their different oxidation states.

The measurements of chemical distribution of radioactive chlorine ( $\text{Cl}^{35}$ ) and bromine ( $\text{Br}^{84}$ ,  $\text{Br}^{82}$ ) obtained by fast neutron irradiation of potassium and rubidium acetate respectively have shown that radiohalogen atoms substitute into an alkyl radical, though in a percentually low fraction. The higher fraction of radioactivity is found in the inorganic form. It has also been shown that 15–50% of radiochlorine and radiobromine formed by the  $(n, \gamma)$  reaction in sodium chloroacetate, sodium bromoacetate and bromoacetic acid stabilize by substitution into an aliphatic chain or enter recombination reactions of the original compound. The results are discussed in the light of Libby's theory.

The distribution of  $\text{I}^{128}$  over the higher ( $\text{IO}_3^-$ ) and the lower ( $\text{I}_2$ ,  $\text{I}^-$ ) oxidation states has been determined by analyses of  $\text{I}_2\text{O}_5$ ,  $\text{I}_2\text{O}_3$ ,  $\text{SO}_3$  and  $\text{I}_2\text{O}_6$  irradiated by thermal neutrons. The fraction of activity found in the iodate fraction increases with the degree of oxidation of iodine.

Thermal annealing of the products of Szilard-Chalmers reactions in neutron irradiated alkali chlorates is similar to the annealing in most salts containing oxyanions. In perchlorates and in sodium chlorate, on the other hand, an *inverse* type of annealing was observed, which means that the percentage of the activity in the chlorate – chlorite – hypochlorite fraction decreases on heating. No activity was found in the perchlorate fraction even after thermal annealing of neutron irradiated alkali perchlorates. The sensitivity to annealing in sodium perchlorate was observed to be affected by the thermal treatment of the salts, previous to neutron irradiation. The description of the experiments is followed by the discussion.

Parts of the thesis were published:

*J. Inorg. Nucl. Chem.* 14 (1960) 134–135; *ibid.* 24 (1962) 139–146.

*Chemical Effects of Nuclear Transformation*, IAEA, VIENNA, 1961, 551–555

Examiners: Prof. M. Mirnik, Doc. Dr. C. Đorđević, Dr. K. Ilakovac.

Oral Examination: May 8, 1962; Degree conferred: June 30, 1962.

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

(100 pages, 10 figures, 6 tables, 136 references, original in Croatian and English)

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541.28

1. Chemical States of Radiohalogens Formed by Nuclear Reactions in Solids

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Annealing

— , thermal

Effects chemical

— — , nuclear transformations

Radiohalogens

Szillard — Chalmers processes



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