

**COCRYSTALLIZATION METHOD TO STUDY PROPERTIES OF Rf AND Db
AND SEARCH FOR EC-DECAY OF ^{268}Db**

Aksenov N.V., Bozhikov G.A., Astakhov A.A., Dmitriev S.N.

*Flerov Laboratory of Nuclear Reactions, JINR, Joliot-Curie 6, Dubna, 141980, Russia,
e-mail: nikolay.aksenov@jinr.ru*

Experiments with transactinide elements is very complicated since they have only short-lived radioactive isotopes and can be obtained in nuclear reactions at accelerators of heavy ions at only at one-atom-at-a-time level. The latest discovery of superheavy elements with $Z = 113-118$ made this topic is one of hottest in nuclear chemistry and lead to a new direction in chemistry – chemistry of single atoms. At one atom a time scale a classical derivation of the law of mass action is no longer valid and the studied one atom must be subjected to a repetitive partition experiment to ensure a statistically significant behavior. In aqueous phase chemistry up to now methods have been limited to ion exchange and extraction chromatography. The longer half-lives of hours of unique radionuclides of transactinides $^{267}_{104}\text{Rf}$ and $^{268}_{105}\text{Db}$ discovered in the $\text{An} + ^{48}\text{Ca}$ reactions expands the application of radiochemical techniques for their chemical characterization and to elucidate the influence of relativistic effects on the chemical properties within a group in the periodic table. One of the methods for characterizing the physicochemical properties of radioactive elements in solutions is their coprecipitation with crystalline precipitates. The first study and first observations on coprecipitation of transactinide elements Rf/Db with La hydroxide was reported in.¹ Description of that isolation of Rf and/or Db from many elements by coprecipitation with La hydroxide was studied and separation method was developed and realized in.² Here we report a new approach of the cocrystallization behavior of Ti, Zr and Hf as lighter homologues of Rf and Nb, Ta as homologues of Db with lanthanum fluoride³. This method was applied by authors to separate Rf and Db in.⁴ In our contribution we present new results of search for EC-decay of ^{268}Db , summarize first experiments and discuss the possibilities for studying the properties of Rf and Db using cocrystallization techniques.

References

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