

Gas phase chemical studies of the superheavy elements at the SHE Factory with a focus on Cn and Fl

N.V. Aksenov¹, A.S. Madumarov¹, A.I. Golczman¹, A.A. Astakhov¹, G.A. Bozhikov¹, A.Yu. Bodrov¹, L.S. Porobanuk¹, I.V. Muravyov¹, I. Chuprakov¹, A.V. Sabelnikov¹, Y.A. Popov¹, O.N. Malyshev¹, A.I. Svirikhin¹, Y. Wang², Z. M. Jia², S. W. Cao², Y.F. Cui², X. J. Yin², Z. Qin²

¹*Flerov Laboratory of Nuclear Reactions, Joint Institute for Nuclear Research, Dubna Russia*

²*Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China*

The chemistry of Cn and Fl has been the subject of long-term studies by two collaborations, which formed scientific chemistry programs at the accelerator laboratories FLNR and GSI [1,2]. Despite the obtained outstanding results, both experimental series are not conclusive due to the unpredicted observation of two adsorption zones in gas thermochromatography. The small number of observed Fl atoms also introduces an element of uncertainty in the interpretations of this observation. In the first series of experiments at the SHE Factory, before further detailed speciation studies, we repeat the TASCA experiment with the FLNR improved chemical setup behind the GRAND separator. Experiments on the synthesis of ^{286,287}Fl in the reaction ²⁴²Pu(⁴⁸Ca,3-4n) using the DGFRS-2 and GRAND separators were preceded chemical studies [3,4]. The setup called Cryodetector, previously used for Nh studies [5], was equipped with a new RTC designed for the focal plane of the GRAND separator. New gold coated detectors array with an extended temperature gradient down to -170 °C were fabricated. 8 decay chains assigned to adsorption of ²⁸⁷Fl and ²⁸³Cn were detected indicating two deposition zones at room temperature and around -100 °C, confirming previous observations. The report briefly discusses research prospects related to the creation of an experimental base at the SHE Factory: a superconducting separator GASSOL for radiochemical research, a cryogenic gas ion trap, and a new chemical setup.

References

- [1] R. Eichler *et al.* Radiochim. Acta 98, 133 (2010).
- [2] A. Yakushev *et al.* Front. Chem. 10:976635 (2022).
- [3] Yu.Ts. Oganessian *et al.* Phys. Rev. C, 106, 024612 (2022).
- [4] A.V. Yeremin *et al.* PEPAN Letters, 21, 3 (2024).
- [5] N.V. Aksenov *et al.* Eur. Phys. J., A 53, 158 (2017).