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Radiochemical investigation of the kinematics of multi-nucleon transfer reactions in ^{48}Ca + ^{248}Cm collisions at 1.1 x B

M. Götz[1], S. Götz[1], J.V. Kratz[1], Ch.E. Düllmann[1,2,3], J. Ballof[1], H. Dorrer[1], J. Grund[1], E. Jäger[2], O. Keller[1], J. Krier[2], J. Khuyagbaatar[2,3], L. Lens[1], B. Lommel[2], Ch. Mokry[1], K.J. Moody[5], J. Runke[2], M. Schädel[4], B. Schausten[2], D. Shaughnessy[5], J. Steiner[2], P. Thörle-Pospiech[1], N. Trautmann[1], N. Wiehl[1,3], A. Yakushev[2], V. Yakusheva[2]

[1] *Institute of Nuclear Chemistry, University of Mainz, 55128 Mainz, Germany*
[2] *GSI Helmholtz Center for Heavy-Ion Research, 64291 Darmstadt, Germany*
[3] *HIM Helmholtz Institute Mainz, 55128 Mainz, Germany*
[4] *Advanced Science Research Center, JAEA, Tokai-mura, Ibaraki 319-1195, Japan*
[5] *Lawrence Livermore National Laboratory, Livermore, CA, USA*

The renewed interest in multi-nucleon transfer reactions as a promising tool for the production of neutron-rich transactinide isotopes [1,2,3,4] has motivated us to perform a ^{48}Ca+^{248}Cm bombardment at an incident energy 10% above the Coulomb barrier to study angular distributions and recoil ranges of Cf through Fm isotopes. These were stopped in Ni catcher foils covering slices of laboratory angles between 17° and 65° and differential recoil ranges between 3 µm and 6 µm. The foils were dissolved in dilute nitric acid, tracer activities of Lu and Eu were added for chemical yield determination, and the activities were co-precipitated with $Fe(OH)_3$ using ammonia to remove Ni, separated from Fe, Pa, U, Np, and Pu on an anion-exchange column in 8 M HCl, separated from Th and Ra on a cation-exchange column in 2.25 M HCl, and separated on a cation-exchange column with 0.12 M α-HiB and 0.14 M α-HiB at pH=4.80 into a Fm(Es) fraction and a Cf(Bk) fraction, respectively. These were prepared for α-particle spectroscopy and spontaneous-fission counting. The investigated parameters are the centroids of the post-neutron emission isotope distributions and their displacement from the most probable primary fragment mass numbers resulting from Volkov´s generalized Q_{gg} systematics including corrections for the breaking of nucleon pairs in the multi-nucleon transfer process [3,5], the angular distributions, and the total kinetic energy loss TKEL. The results for isotopes of transcurium elements up to Fm are being evaluated and will be presented at the conference.

References

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