Fission Yield Determinations in the Neutron Induced Fission of ^{245}Cm at the Mass Separator Lohengrin

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The fission yields of "minor actinides" that are formed in nuclear reactors are of particular interest in connection with different projects [1] of transmutation discussed recently. One of the more important nuclides in this context is ^{245}Cm. A program was started to determine fission yields in the thermal neutron induced fission of ^{245}Cm at the mass separator Lohengrin of the Institute Laue-Langevin in Grenoble. Previous measurements in this fission reaction by Friedrichs [2] provided yields of single nuclides in the mass region from A= 76 to 94. In the region of higher masses only **chain** yields could be determined by Friedrichs due to the limited nuclear charge resolution of his ionisation chamber. In the present work, the nuclear charge assignment was made using the specific energy loss in a stack of foils of Parylene C as developed and used previously by Quade [3].

The ^{245}Cm-targets for the experiments were prepared at this institute from curium deposited on aluminium planchets of 9 cm diameter. The isotopic composition of this curium was measured (on 27. 06. 96) to be 8.7% of ^{244}Cm and 91.3 % of ^{245}Cm. For the target preparation the curium was dissolved, purified and electrodeposited on circular titanium foils (diameter 3 cm, thickness: 50 μm) as a round spot of 4 mm diameter. A total of 6 targets were prepared (with amounts of ^{245}Cm ranging from 13 to 16 μg each) and shipped to the ILL (Grenoble).

A first series of experiments of 17 days has taken place in August 1999. In this experimental series first results could be obtained of the nuclear charge distribution in the mass region of A=93 up to A=114. Independent yields of single nuclides could be measured up to Z=49 (indium). This is better than expected. In general, the resolution in Z of the technique of specific energy loss used here decreases with the mass of the fission fragments. The heaviest fragments that could be analysed for nuclear charge distribution so far were A=106 [3] with a corresponding Z=45.

The fact that the measurements could be pushed up by 8 mass units is probably due to the good performance of Lohengrin and to the cleaning up of the beam of fission fragments by the RED-magnet [4] that has been added recently. This achievement gives hope that the region of symmetry can be made available for these measurements – a particularly interesting aspect from a fundamental standpoint, because it is expected that in symmetric fission nuclear charge distribution and energy distribution differ from the normal behaviour as observed in asymmetric fission.

The measurements carried out in August 1999 cover different ionic charge states and different kinetic energies of the fission fragments and will allow an integration over these distributions. A first preliminary evaluation has been carried out. At least one more experimental series is, however, planned before experimental results can be published.

References:

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