



Contribution ID: 84

Type: Poster

Beta delayed fission studies of the neutron deficient Tl, At and Fr nuclei

Thursday, 24 May 2012 17:50 (20 minutes)

Valentina Liberati *University of the West of Scotland, Paisley UK.* On behalf of IS466 Collaboration, the ISOLDE collaboration and
 Paisley-Leuven-Los-Alamos-Bratislava-Darmstadt-Geneva-
 Gent-Grenoble-Liverpool-Manchester-Orsay-Tokai.

Beta delayed fission (β DF) is a rare nuclear decay process which couples β decay

and fission. In this two-step process, a parent nucleus first undergoes β decay, possibly populating states in the daughter nucleus close to the top of the fission barrier, thus allowing the fission of the daughter to be competitive with other decay modes.

The occurrence of this process has been previously observed in several heavy nuclei in the actinides region ($N/Z \sim 1.5-1.6$) due to the relatively large Q_{ec} value of the parent nucleus and the small fission barrier of the daughter.

According to semiempirical estimates, β DF is also likely to happen in the neutron-deficient region from Tl ($Z=81$) to Fr ($Z=87$), where high Q_{ec} values of up to 12 MeV are expected. The uniqueness of β DF in the lead region lies in the possibility of reaching exotic nuclei with an unusual N/Z ratio, e.g. $N/Z=1.25$ for ^{180}Hg , the β decay product of ^{180}Tl , which do not undergo spontaneous fission, and thus, it allows the investigation of their low-energy fission properties.

This talk reviews the results of an experimental campaign carried out at the ISOLDE mass-separator at CERN, in which a search for the β DF decay of isotopes $^{178-184}\text{Tl}$, $^{193-196}\text{At}$ and $^{200-202}\text{Fr}$ has been performed. A novel and key feature of this work was the production of pure sources of the Tl and At isotopes using resonant laser ionization followed by mass separation.

A surprising outcome resulted from the β DF study of ^{180}Tl , where a completely unexpected asymmetrical mass split of the fission products of ^{180}Hg was observed([1]). Furthermore, evidence for the β DF of ^{178}Tl , $^{194,196}\text{At}$ and ^{202}Fr was obtained and an asymmetrical mass split of the fission products of ^{178}Tl is suggested. Together with the data for ^{180}Tl , this has established a new island of asymmetric fission, in addition to the previously known one in the heavy actinides nuclei. The experimental details and the results will be discussed in this contribution.

References

[1] A. N. Andreyev et al. Phys. Rev. Lett., 105 252502 (2010).

Primary author: Ms LIBERATI, Valentina (University of the West of Scotland)

Presenter: Ms LIBERATI, Valentina (University of the West of Scotland)

Session Classification: Poster Prize Presentations

Track Classification: Nuclear structure far from stability