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Calculation of fission fragment mass distributions by using a semi-empirical method

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Fission product yield data are important for applications of nuclear technology such as the estimation of decay heat, operation of nuclear reactors and handling of spent fuels. However, due to the short life-time, a large part of fission fragment yield data cannot be obtained from measurements. Therefore, models of fission fragment yields are needed for such unmeasured cases. Though many theoretical fission models are developed, the calculation results are not necessarily accurate enough to reproduce the fission observables quantitatively. On the other hand, semi-empirical models may be useful in describing fission product yields in a simple way but with a relatively good accuracy.
We developed a semi-empirical fission model based on the saddle point fission model of Itkis [1] and Schmidt [2]. It is assumed that fission product yields are determined by the fission barrier to some extent whereas values of the effects of detailed nuclear dynamics from saddle to scission are included in our model parameters. The parameters for our empirical model are deduced by fitting the evaluated fission yields to the ENDF data, and we found that the parameters can be expressed in simple forms. The calculated fission product yields from our model which has 10 parameters can reproduce the yields nearly as well as GEF.

[1] Itkis et al., Z. Phys. A 320 (1985) 433. [2] K.-H. Schmidt et al., Nucl. Data Sheets 131 (2016) 107.

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