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PROBING ISOSCALING TO DETERMINE THE NUCLEAR TEMPERATURE IN LOW-ENERGY FISSION

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We examined the bulk of available yields of fission fragments from Z=28 to Z=67 verifying the applicability of isoscaling for low-energy fission.
The phenomenon of isoscaling indicates the statistical distribution of the energy, released during the fission process, among the corresponding fission fragments. This behavior has been already discovered in special cases of fission processes as described in previous studies (from the first work [1] to the latest one [2]).
In this connection, the yields (Y_1,Y_2) of specific isotopes with (N, Z), produced in two similar fission reactions, are related by the following equation:
\begin{equation}
\frac{Y_2}{Y_1} = C \cdot exp(\alpha \cdot N + \beta \cdot Z) ,
\end{equation}
where C is a normalisation constant.
The isoscaling parameters (α and β) were obtained by fits applied to the ratios of fission fragment yields available for 4 different energy classes of low-energy fission processes compiled in ENDF/B-VII.1 data library for fissioning nuclei with atomic numbers from 90 (Th) to 100 (Fm) [3]. The isoscaling parameters are related to the nuclear temperature, the mass and the atomic numbers of the nuclei, undergoing fission, and the symmetry energy coefficient C_{sym}. The last magnitude is well known from fits of experimental binding energies achieved within the liquid drop model [4]. The value C_{sym} = 23 MeV, adopted therefrom, is used to evaluate nuclear temperatures which are in rather good agreement with corresponding values obtained by other approaches such as the isotope thermometry [5].
This new approach to extract the nuclear temperature in low-energy fission is described in details.

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