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Influence of prompt neutron emission on the distribution of charge as a function of the final mass and kinetic energy of fragments from the reaction $^{233}\text{U}(\text{nth}, \text{f})$

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Concerning thermal neutron induced fission of uranium 233, using a Monte Carlo simulation, we show how prompt neutron emission from fragments distorts the distribution of charge as a function of final mass and kinetic energy compared with the primary distribution. Since fission discovery, the yield of primary charge (Z), mass (A) and kinetic energy (E), has been one of the objectives of measurements of fragments [1]. However, only the yield of final fragment charge (z), mass (m) and kinetic energy (e), after prompt neutron emission, defined as $Y(z, m, e)$, is accessible in low energy fission [1, 2]. In our Monte Carlo simulation, for each m , we calculate, the average of charge as a function of e . As input for the simulation, we assume that: i) the prompt neutron number (n) decreases linearly with kinetic energy (E), it's equal to the neutron multiplicity (ν) when E is equal to the corresponding average, and it falls to zero at the corresponding maximal value (E_{max}) [3] and ii) the average of primary fragment charge is proportional to the primary fragment mass (A) and to the charge/mass ratio of fissioning nucleus (92/234). As output of the simulation, we obtain the distribution of final fragment mass ($m=A-n$), kinetic energy ($e=E(1-n/A)$) and charge ($z=Z$). As a result, for a fixed final mass in the region $m = 80 - 100$, prompt neutron emission produces a negative slope in the curve of average charge as a function of e . This result is in agreement with experimental data obtained by Quade et al [1]. Surprisingly, in the region of heavy fragment, contrary to what happens in the mass region $m = 80 - 100$, the curve of average charge as a function of e has a positive slope. In order to compare this results in that heavy mass region, data from experiments with new technologies is expected [2].

1. U. Quade et al., Nucl. Phys. A 487 (1988) 1-36
2. P. Grabitz et al., Journal of Low Temperature Physics 184 (2016) 944-951
3. M. Montoyaa, J. Rojasa and I. Lobato, Rev. mex. fis. 54 (2008) 440-445

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