ID de Contribution: **22** Type: **Non spécifié**

Rotational angular momenta of fission fragments studied by antisymmetried molecular dynamics

jeudi 23 juin 2022 09:15 (30 minutes)

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Angular momentum of fission fragments (FFs) is an important physics quantity which governs the statistical decay of excited FFs through conservation law formulated as the Hauser-Feshbach theory, which leads to the independent fission products. Indeed, spins of the fission fragments are "measured"by applying the Hauser-Feshbach theory to interpret various observables, such as photon spectra or isomer ratios, obtained after the statistical decay. Despite its importance, direct observation nor theoretical estimation of spins of the FFs is not an easy task, and much uncertainty still exist. Origin of the spins of FFs itself is uncertain. Historically, spins of the FFs are discussed in relation to rotation of the fission fragments, and possibility of several rotational modes have been suggested, namely, bending, wiggling, tilting and twisting modes. The first 2 of this list refer to rotation of FFs perpendicular to the fission axis, while the last 2 refer to rotation in parallel or antiparallel to the fission axis. In this talk, we will explain results of calculation of the rotational angular momentum of FFs, their relative orientation and their orientation with respect to the fission axis. These quantities were obtained by the antisymmetrized molecular dynamics, which takes account of the mean-field effects and stochastic nucleon-nucleon collision, the latter giving branching of the wave function and gives "distributions" of any quantities we can calculate. Our results, which can be fitted nicely by the conventional Fermi-gas spin distribution function, were compared with those calculated by Bulgac et al. with a legitimate method based on time-dependent density functional theory and angular momentum projection. Interesting similarities and differences were observed.

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Classification de Session: Shape dynamics models