

CLUSTERING AND MICROSCOPICALLY SEPARATED STATES FORMATION IN FISSION POTENTIAL ENERGY CALCULATIONS

Monday, 20 September 2021 15:35 (25 minutes)

Potential Energy calculations are the basis for static and dynamic studies of the nuclear fission process. Calculation of surface, nuclear, Coulomb, rotational functionals, curvature, congruence, and Wigner energy functionals was recently presented for a wide variety of nuclear shape parameterizations [1].

Current approaches typically aim to achieve a theoretical description of the potential energies and shapes of a fissioning system along the conventional fission valleys. In contrast, we study the whole potential energy surface using a realistic mean field and flexible shape parameterization [2], with the aim of treating specific areas of surface related to the new cluster structure formation. To achieve this, we conducted calculations of the regions of maximum energy, saddle points and partly ridges separating the various passes to fission.

Nucleon localization relative to the cluster formation has been studied based on the realistic mean field calculations [3]. Rearrangement of nucleons gives rise to decentralized dynamics in a fissile system in terms of nucleon degrees of freedom.

Decentralized model approach is suggested with the aim of finding specific requirements needed for the new cluster state formation. Clustering could be simulated as a dynamics of neighboring particles. This type of dynamics occurs when particles can autonomously adapt to their environment. There are many examples in nature where adaptability arises from simple decentralized processes [4].

References:

1. A.V. Karpov et al., *Computer Physics Communications* **258**, 107605 (2021).
2. V.V. Pashkevich, Y.V. Pyatkov, A.V. Unzhakova, *JMP E* **19**, 718 (2010).
3. A.V. Unzhakova, O.N. Granichin, *Exotic Nuclei* **351** (2019).
4. Y.V. Ivanskiy et al., *Int. Conf. CoDIT, Malta* DOI:10.1109/CoDIT.2016.7593526 (2016).

Primary authors: Dr UNZHAKOVA, Anna (Saint Petersburg State University); Dr IVANSKIY, Yuri (Saint Petersburg State University)

Presenter: Dr UNZHAKOVA, Anna (Saint Petersburg State University)

Session Classification: Section 2. Experimental and theoretical studies of nuclear reactions

Track Classification: Section 2. Experimental and theoretical studies of nuclear reactions.