NUCLEAR REACTION PATH AND INERTIAL MASS IN THE SELF-CONSISTENT COLLECTIVE COORDINATE METHOD

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Radioactive isotope facilities of the new generation enable us to access unexplored territories of unstable nuclei with large neutron excess. Non-empirical theoretical approaches to structure and reaction of unknown nuclei are becoming more and more important in these days. In addition, disposal of long-lived fission products is an issue in nuclear power generation. However, current nuclear reaction data are not sufficient to evaluate the feasibility of nuclear transmutation. In order to find new features and useful concepts for these studies, a new approach, which is capable of calculating structure and reaction properties and of performing systematic calculations for nuclei across the entire nuclear chart, is desired. The nuclear energy density functional (EDF) approach provides powerful tools for this purpose. There are known limitations in the EDF approaches, associated with its semi-classical nature. We think that the re-quantization of its dynamics is a promising method to overcome those difficulties.

We are applying the adiabatic self-consistent collective coordinate (ASCC) method, which we proposed in 2000, to nuclear reactions. Recently, we have succeeded to determine the reaction path and associated inertial mass parameters for light nuclei. In this presentation, we will show our recent results on these applications and try to elucidate nuclear non-linear dynamics beyond the linear regime.

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