STUDY OF LIGHT EXOTIC AND STABLE NUCLEI WITH HEAVY ION REACTIONS

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The structure and interactions of the nuclei out of the stability region (*exotic nuclei*) are insufficiently studied yet. There are two experimental methods to realize such investigations: the first one are the experiments with radioactive (secondary) beams (*direct method*) and the second one are the experiments with the stable ion beams producing many-nucleon-transfer reactions. Both methods are used at present and successfully complement one another.

The development of nuclear reaction theory and the computational methods gave the possibilities of more widely using of the second method - stable ion beams experiments with the nucleon- and cluster-transfer reactions. It should be noticed, that investigation of the exotic nuclei interactions, presented in this seminar, needs of simultaneous investigation of stable nuclei, taking part in these same reactions.

The theoretical analysis of the data, concerning study of exotic nuclei with heavy-ion reactions is more complex than the investigations using direct method. Whereas the data of elastic and inelastic scattering of radioactive ions are analysed with the optical model (OM) and coupled-reaction-channels method (CRC) using in entrance and exit channels the nucleus-nucleus potentials of the same systems, the incoming and outgoing reaction systems are different for the transfer reactions. Before the CRC-calculation of reaction cross-section, the potential parameters for the entrance reaction channel must be deduced from the analysis of the elastic and inelastic scattering data. Moreover, because the parameters of nucleus-nucleus potentials are energy-dependent, the studies of energy dependence of these parameters play important role in investigation of nuclear reaction of the exotic nuclei.

The next problem for the transfer reaction studies is the calculations of the nucleon and cluster spectroscopic amplitudes (SA). These calculations for nucleons and clusters can be made in the frame of Translationary Invariant Shell Model (TISM). The large base of TISM cluster SA were calculated and successfully applied in the present reaction studies.