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Study of the influence of the projectile nucleus structure on the interacting mechanism in cold fusion reactions

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Cold fusion reactions are one of the successful ways for superheavy element synthesis. The largest evaporation residue (ER) formation cross-section was found in the reaction 48Ca+208Pb. For the reactions with other Ca isotopes, as well as 40Ar and 50Ti ER cross sections are one or even two orders of magnitude lower compared to 48Ca projectile.

The 48Ca nucleus has a unique structure. It is doubly magic nucleus (Z=20, N=28), consisting of 40Ca core and a neutron skin. In order to investigate the impact of structural peculiarities of the projectiles near 48Ca in the cold fusion reactions on the capture process and the further evolution of the formed dinuclear system, the capture cross sections and mass-energy distributions of binary fragments formed in the reactions 40Ar, 40Ca, 44Ca, 48Ca, 50Ti + 208Pb at interaction energies above and well below the Coulomb barrier have been measured. The separation of fusion-fission component from the quasifission one is based on the analysis of the properties of measured mass-energy distributions for fission-like fragments. The influence of two additional or deficient protons or neutrons in the projectile on the reaction dynamics will be discussed.

All experiments were carried out at the U-400 accelerator FLNR JINR, Dubna. The CORSET double-arm time-of-flight spectrometer was used to measure mass and energy distributions of the reaction products.

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