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Nuclear reactions with weakly bound nuclei at energies near to the coulomb barrier

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In this work the experimental and theoretical study of 6Li, 10C + 58Ni systems is presented. On one hand, 6Li is a stable weakly bound nucleus, its α + d break-up threshold is 1.47 MeV. On the other hand, 10C is an unstable nucleus with excess of protons and can break into three possible channels: 2p + 8Be, with binding energy of 3.820 MeV, 9B + p with binding energy of 4.006 MeV; and 6Be + α with binding energy of 5.101 MeV, respectively. Lithium-6 and 10C beams were delivered by the TWINSOL facility, to induce the 3He(6Li,n)8B and 3He(10B,10C)3H nuclear reactions at the University of Notre Dame. A test experiment was performed with natural Ni and 58Ni targets (1.36 mg/cm2 and 0.924 mg/cm2 respectively) using 36 and 38 MeV for the primary 6Li beam, 47 and 54 MeV for primary 10B beam. The fusion excitation function for the 6Li + 58Ni system was measured at energies near and below the Coulomb barrier.
The procedure to deduce the fusion cross sections from the angular distributions measured for the evaporated protons from the compound nucleus was based using the proton multiplicity predicted by the PACE, LILITA and CASCADE codes. So far, elastic scattering measurements have been performed for the 10C + 58Ni system, but fusion will also be measured by detecting the respective evaporation protons. Additionally, coupled channel (CC) calculations of elastic scattering cross sections for the systems above mentioned were made.

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