

# 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  ${}^6\text{Li}$ ,  ${}^{10}\text{C} + {}^{58}\text{Ni}$  systems is presented. On one hand,  ${}^6\text{Li}$  is a stable weakly bound nucleus, its  $\alpha + d$  break-up threshold is 1.47 MeV. On the other hand,  ${}^{10}\text{C}$  is an unstable nucleus with excess of protons and can break into three possible channels:  $2p + {}^8\text{Be}$ , with binding energy of 3.820 MeV,  $9B + p$  with binding energy of 4.006 MeV; and  ${}^6\text{Be} + \alpha$  with binding energy of 5.101 MeV, respectively. Lithium-6 and  ${}^{10}\text{C}$  beams were delivered by the TWINSOL facility, to induce the  ${}^3\text{He}({}^6\text{Li},n){}^8\text{B}$  and  ${}^3\text{He}({}^{10}\text{B},{}^{10}\text{C}){}^3\text{H}$  nuclear reactions at the University of Notre Dame. A test experiment was performed with natural Ni and  ${}^{58}\text{Ni}$  targets (1.36 mg/cm<sup>2</sup> and 0.924 mg/cm<sup>2</sup> respectively) using 36 and 38 MeV for the primary  ${}^6\text{Li}$  beam, 47 and 54 MeV for primary  ${}^{10}\text{B}$  beam. The fusion excitation function for the  ${}^6\text{Li} + {}^{58}\text{Ni}$  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  ${}^{10}\text{C} + {}^{58}\text{Ni}$  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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