Contribution ID: **122** Type: **Poster**

Elastic scattering of 17O ions from 58Ni at near-barrier energies

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A powerful tool for the study of weakly bound nuclei is the elastic scattering process, which provides a first information on the overall reactivity of the collision participants. We measured the elastic scattering angular distributions for the reaction 17O+58Ni in order to compare the reactivity of 17O (Sn= 4.143 MeV) with its mirror nucleus 17F (S_p= 0.600 MeV). The experiment was performed at the Laboratori Nazionali di Legnaro with an 17O beam in the energy range 40.0-50.0 MeV impinging on a 58Ni (150ug/cm2) target with a 208Pb (50ug/cm2) backing. Three Eres DSSSDs modules of the EXPADES [1] array where placed at +-50° (45°<theta<80°) and +110° (111°<theta<140°). Data were analyzed within the frame of the Optical Model using both Woods-Saxon and M3Y double-folding potentials. Fig. 1 shows the elastic scattering angular distributions and the optical model best fits for the two approaches. The resulting fit parameters agree with a model describing the 17O nucleus as a 16O core with a valence neutron orbiting in a d5/2 state [2]. The reduced total reaction cross sections, shown in the inset of Fig. 1, result to be slightly lower than those of 16O+58Ni system [3], but higher than those of 17F+58Ni system [4]. This outcome suggests that, for the pair 17O-17F, nuclear structure effects play a more relevant role than the projectile binding energy in the reaction dynamics at Coulomb barrier energies.

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Track Classification: Reactions and Structure - Unstable Nuclei