THE 40CA+58,64NI SUBBARRIER FUSION REACTIONS: INTERPLAY BETWEEN INELASTIC AND TRANSFER CHANNELS

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Heavy-ion fusion reactions at energies near the Coulomb barrier are influenced by couplings between the relative motion and nuclear intrinsic degrees of freedom of the colliding nuclei. Fusion cross sections have recently been measured for the $^{40}Ca+^{58}Ni$ and $^{40}Ca+^{64}Ni$ systems using the LNL (Laboratori Nazionali di Legnaro) electrostatic deflector at energies around and below the Coulomb barrier in order to study the interplay between nuclear structure and reaction dynamics. The measured and calculated fusion excitation functions and barrier distributions highlight the influence of couplings to inelastic channels as well as nucleon transfer channels with positive Q values on the fusion cross sections at sub-barrier energies. Microscopic Time-Dependant Hartree-Fock calculations of these reactions will be presented also showing large neutron transfer probabilities in the $^{40}Ca+^{64}Ni$ system. Nucleon transfer cross-sections have subsequently been investigated experimentally for these systems at energies around and below the Coulomb barrier using the LNL XTU Tandem accelerator and the PRISMA magnetic spectrometer to explore directly such effects of couplings to transfer channels. First results will be presented and discussed.