

Near-barrier reactions with radioactive ion beams at the ReA3 facility

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The new ReA3 reaccelerated beam facility at the National Superconducting Cyclotron Laboratory (NSCL) will provide high quality radioactive ion beams (RIBs), produced from fast fragmentation reactions, at energies around the Coulomb barrier. A gas-catcher, charge breeding ion source, and a linear accelerator have been developed to stop, ionize, and re-accelerate the RIBs at energies up to 3-6 MeV/u. Potentially, any RIB that can be produced from the fast fragmentation reactions will now be available for study at energies around the Coulomb barrier. These radioactive isotopes can have exotic properties such as neutron/proton skins, halos, or unexpected changes in their shell structure. ReA3 will allow us to explore how these exotic properties manifest themselves in low-energy reactions. In particular, heavy-ion fusion induced with medium mass RIBs remains almost completely unexplored as only three fusion reactions using RIBs, between oxygen ($Z=8$) and tin ($Z=50$), have ever been measured. A new research program focused on the study of heavy-ion fusion reactions is being developed to take advantage of the world-unique RIBs offered by the ReA3 facility. Along with an overview of the ReA3 facility, details about three devices being developed for exploration of fusion reactions induced by RIBs will be discussed.