Neutron-Rich Rare Isotope Production below the Fermi Energy and its Application to the Texas A&M RIB Upgrade.

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An overview of recent efforts to produce and separate neutron-rich rare isotopes in quasielastic and deep-inelastic collisions below the Fermi energy will be given. The experiments have been performed at the Cyclotron Institute of Texas A&M University employing beams from the K500 Superconducting Cyclotron. Two magnetic separators were used: the MARS recoil separator [1] and the Superconducting Solenoid Line (BigSol Line) [2]. In all these efforts we observed an enhanced production of neutron-rich nuclides in comparison with high-energy fragmentation mechanisms. This trend, attributed to the role of the nuclear periphery of the target, has been analysed and interpreted in [3] (see, also, RNB-7 contribution by M. Veselsky). From a practical viewpoint, it is concluded that reactions below or around the Fermi energy offer a novel way to access very neutron-rich rare isotopes.

The experience obtained in the production of RIBs below the Fermi energy will be exploited in the RIB upgrade of the Cyclotron Institute [4]. An overview of the upgrade, the current status and the RIB expectations will be outlined. Finally, the possibilities to extend the application of the above methods using neutron-rich radioactive beams at existing radioactive beam facilities and, in the future, at the proposed Rare Isotope Accelerator Facility (RIA) in the US and EURISOL in Europe will be outlined.

[1] G.A. Souliotis et al., Phys. Rev. Lett. 91 (2003) 022701; Phys. Lett. B 543 (2002) 163; and Nucl. Instrum. Methods B 204 166 (2003).
[2] G.A. Souliotis et al., Phys. Rev. C 73 024606 (2006).
[3] M. Veselsky and G.A. Souliotis, Nucl. Phys. A 765, 252 (2006).
[4] `A Proposed Facility Upgrade for the Texas A&M Univ. Cycloton Institute, accessible at: http://cyclotron.tamu.edu.