THE ADVANCED CONCEPT GROUP RESEARCH AND DEVELOPMENT PROGRAM: A BRIEF OVERVIEW

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The mission of the former Target and Ion Source Research and Development Group has been expanded to include a variety of additional responsibilities that can better be described under the aegis of the title, The Advanced Concept Group. Among the responsibilities of the Group are finding solutions to several challenging target/ion source related problems, endemically and generically associated with the production and generation of useful radioactive-ion beam (RIB) intensities at any facility predicated on the use of the ISOL technique. In order to be successful in the near-term and future, satisfactory solutions to these problems **must** be quickly and effectively found in each of these arenas. The responsibilities of the Group include: the production, generation, acceleration and transport of high intensity radioactive-ion beams; the development of diagnostic methods, experimental equipment and techniques for the determination of the intrinsic properties of ion beams; the development of theoretical models and computational tools required for predicting phenomena related to the efficient production and generation of high intensity radioactive-ion beams (e.g., the time dependence of the diffusion release and effusive flow processes); the experimental measurement of parameters required for predicting phenomena important in the diffusion-release and effusive-transport of radioactive species; and the acquisition of thermo-chemical, thermodynamic, equilibrium-composition, phase diagram, diffusion-parameter, and other references and computational tools necessary for executing the primary objectives of the Group.

Since formation of the original Target and Ion Source Development Group at the inauguration of the HRIBF project, we have identified and sought to solve the major problems that lay as obstacles to the successful generation of RIBs. During this reporting period, we have made significant strides toward the solution of the diffusion-release problem through the conception, design, and development of novel and innovative composite, solid-phase targets and liquid-phase targets that show promise for generic use at ISOL based RIB facilities. Collaterally, we have designed and developed a number of novel, innovative, and very efficient sources including; a kinetic-ejection negative-ion source that combines high molecular dissociation and ionization efficiencies for direct F^-

generation; a positive-surface-ionization source for generation of RIBs of the Group IA elements (Li, Na, K, Rb, Cs and Fr); a batch-mode Cs-sputter negative-ion source for use in generating RIBs of long-lived species; a multi-sample Cs-sputter negative-ion source, and a RF plasma-sputter negative-ion source, new concept ECR ion sources that exhibit both high efficiency for molecular dissociation and ionization, as well as other sources. In other articles in this report, we chronicle progress made during the past two years toward solving some of the most challenging problems related to RIB generation.

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