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Overview of Target Development for Next Generation Radioactive Beam Experiments[1]

JERRY NOLEN, Physics Division, Argonne National Laboratory

With the increased intensities of radioactive ion beams at present and future facilities a wide variety of target technologies are being brought to bear for the experimental studies undertaken with these beams. For astrophysical reaction studies, classical thin foil targets are still going to be extensively used, mainly as hydrogen- or deuterium-rich plastics (or metals). But more complex target systems such as windowless gas jets, liquid or cryogenic solid targets are being developed. Cryogenic gas cells have also been employed though one must contend with issues relating to the windows used. Active targets usually integrated with time projection chambers are being used with rare beams for their high detection efficiency and also for low energy processes. In an active target, the gas acts as both a target and detector and allows for investigations of nuclear structure and transfer reactions with very high efficiency and at high resolution due to the thickness of the target. Polarized targets, in the form of gas-phase, foil, and crystal targets, are being used and further developed for use at rare isotope facilities. And finally, in heavy-element research, more exotic beams even at moderate intensities can be used with the standard ^{208}Pb as well as exotic actinide targets to perhaps open previously unanticipated reaction channels for the production, chemistry, and spectroscopic studies of isotopes of the heaviest elements. For use with high quality secondary beams, very small samples of rare actinide isotopes in conjunction with high efficiency gamma ray detectors can be used for such research. This talk will be an overview to introduce the topics to be covered in detail in the contributions to this mini-symposium. Prepared in collaboration with John P. Greene, Physics Division, ANL.

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