STUDY OF THE ^{93}Nb + ^{7}Li REACTIONS WITH APPLICATION TO DOUBLE CHARGE EXCHANGE AND POSSIBLE PRODUCTION OF NEW NEUTRON-RICH NUCLEI.

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The primary motivation for this investigation was the production of new neutron-rich nuclei and the study of their nuclear spectroscopy. It was hoped that the use of a neutron-rich projectile, such as ^{7}Li, would enhance the possibility of producing new exotic neutron-rich nuclei. The reaction mechanism to several Z below the target would involve complex multinucleon transfer processes or a rare double charge exchange between projectile and target. Comparison of the mass distributions and excitation functions may enable one to distinguish between the various processes in addition to aiding in our knowledge of the production of the neutron-rich nuclei using light heavy ions.

Initial studies were performed at the BNL three-stage tandem accelerator at ^{7}Li energies of 52.8 MeV and 57.6 MeV. The cross sections for the production of Y isotopes from the ^{93}Nb + ^{7}Li reaction were measured using radiochemistry and γ-ray spectroscopy. Possible interferences from small amounts of elemental impurities were carefully studied and ruled out. At IUCF the Yttrium yields were measured at 58.4 and 90.7 MeV. In Figure 1 are shown preliminary results from the 52.8, 57.6, 58.4, and 90.7 MeV ^{7}Li bombardments of ^{93}Nb. The excitation functions for ^{91}Y and ^{92}Y products clearly demonstrate a different energy dependence. In addition, it is gratifying to see the good agreement at the lower

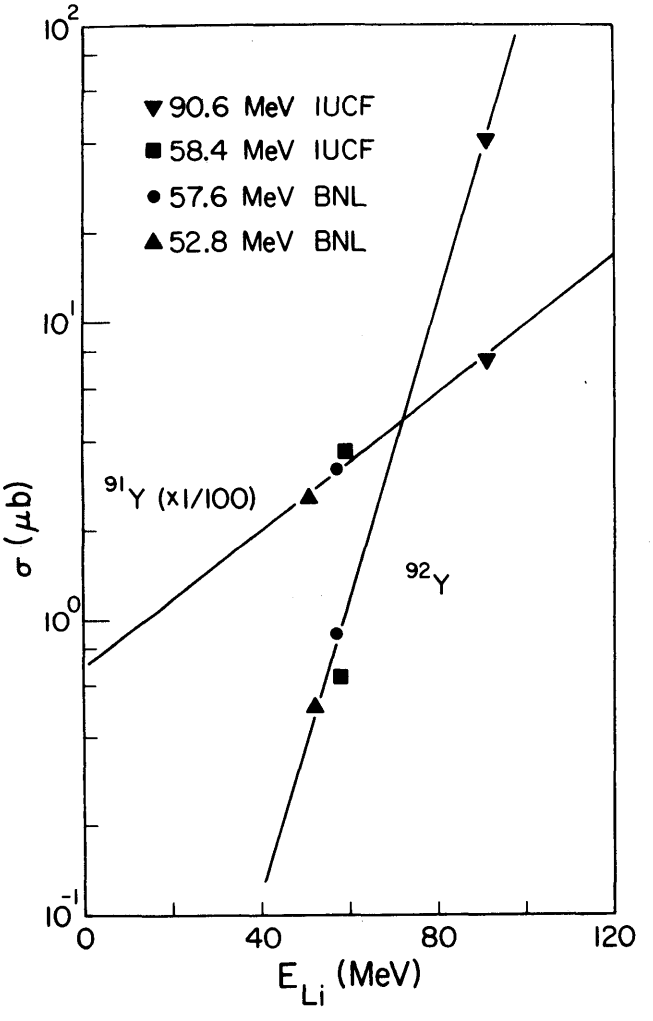

Figure 1. Excitation functions for ^{91}Y and ^{92}Y produced in ^{7}Li reactions on ^{93}Nb.

energies for the two sets of data.

Future runs are planned at 75 MeV and above 100 MeV to complete the Y excitation function and to search for ^{93}Y, the double charge exchange product produced by charge-exchanging two protons in ^{93}Nb into two neutrons in ^{93}Y.