

^8Li -Induced RNB Transfer Reactions on ^9Be for Astrophysics.

Valdir Guimarães, Adriana Barioni, Orli Camargo, Rubens Lichtenthaler.

Instituto de Física da Universidade de São Paulo, São Paulo, São Paulo, Brazil

James J. Kolata.

University of Notre Dame, Notre Dame, Indiana, USA

Hanan Amro, Fred D. Bechetti, Hao Jiang.

University of Michigan, Ann Arbor, Michigan, USA.

Eli. F. Aguilera, David Lizcano, Enrique Martinez-Quiroz, H. Garcia.

Instituto Nacional de Investigaciones Nucleares, Mexico

Angular distributions for $^9\text{Be}(^8\text{Li},^7\text{Li})$, $^9\text{Be}(^8\text{Li},^9\text{Li})$ and $^9\text{Be}(^8\text{Li},^9\text{Be})$ transfer reactions have been measured at the Nuclear Structure Laboratory of the University of Notre Dame, USA. The 27 MeV radioactive ^8Li radioactive nuclear beam (RNB) was obtained with the TWINSOL [1] system. The scattered ^8Li reaction products ^7Li , ^9Li and ^9Be were detected by an array of ΔE -E silicon detector telescopes at 15,20,30,40 degrees. The Asymptotic Normalization Coefficients(ANCs), which are related to reduced widths, were obtained from the comparison between the experimental differential cross section and DWBA calculations. The DWBA code FRESKO is then used to normalize the $^8\text{Li}(n,\gamma)^9\text{Li}$, $^7\text{Li}(n,\gamma)^8\text{Li}$ and $^8\text{Li}(p,\gamma)^9\text{Be}$ capture reactions at low energy. Since these reactions can bridge the mass $A=8$ gap and allow the synthesis of heavier elements, they may be important in some astrophysical environments, such as r-process nucleosynthesis, for neutron stars, and in inhomogeneous big-bang models. Due to small cross section and the limited intensity of secondary, radioactive ^8Li beams, the rate for the $^8\text{Li}(n,\gamma)^9\text{Li}$ capture reaction previously has been estimated only by indirect methods [2,3], and some uncertainties are still present. Here we present preliminary results using nucleon transfer reactions with the ANC method. On-going programs with other transfer reactions for astrophysical interest using the recent installed twin-solenoid Radioactive Ion Beam Facility in Brazil (RIBRAS)[4] also will be presented.

[1] F.D.Becchetti, M.Y.Lee, T.W.O'Donnell, D.A.Roberts, J.J.Kolata, L.O.Lamm, G.Rogachev, V.Guimaraes, P.A.DeYoung, S.Vincent. Nucl. Instr. and Method Res. A 505 (2003) 377.

[2] B. Guo et al. Nucl. Phys. A 761 (2005) 162.

[3] H.Kobayashi, K.Ieki, A.Horvath, A.Galonsky, N.Carlin, F.Deak, T.Gomi, V.Guimaraes, Y.Higurashi, Y.Iwata, A.Kiss, J.J.Kolata, T.Rauscher, H.Schelin, Z.Seres, R.Warner. Phys.Rev. C 67, 015806 (2003)

[4] R.Lichtenthaler, A.Lepine-Szily, V.Guimaraes, C.Perego, V.Placco, O.Camargo, Jr., R.Denke, P.N.de Faria, E.A.Benjamin, N.Added, G.F.Lima, M.S.Hussein, J.Kolata, A.Arazi, Eur.Phys.J. A 25, Supplement 1, 733 (2005).