Angular distribution measurements of $^{6}Li(p,\alpha)^{3}He$ reaction at 140 keV proton energy using nuclear track detectors

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Abstract

Angular distributions of a $^{6}Li(p,\alpha)^{3}He$ reaction were measured at six angles for 140 keV proton energy using nuclear track detectors (NTDs). The measurements were carried out over 60°–160° lab. angles in 20° increments using a scattering chamber of 80° beam line of the 350 kV accelerator. A semiconductor silicon surface barrier (SSB) detector was placed at $+160^{\circ}$ and was used as a monitor. The results have shown that the CR-39 detector has excellent capabilities to distinguish 1.4–2.7 MeV $\alpha + {}^{3}He$ particles from the $^{6}Li(p,\alpha)^{3}He$ reaction and 8–9.4 MeV α-particles from the $^{7}Li(p,\alpha)^{4}He$ reaction through their track diameters. However, it was not possible to distinguish between the 2.3 MeV ^{3}He ions and the 1.7 MeV ^{4}He ions from the $^{6}Li(p,\alpha)^{3}He$ reaction from their track diameter measurements, but it was possible to differentiate between the two, from the darker contrast of the ^{3}He particles caused by its deeper tracks as compared to those of ^{4}He.

Keywords: Angular distribution of $^{6}Li(p,\alpha)$; Nuclear track detectors; $^{7}Li(p,\alpha)$