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Polarization of Neutrons from the $Li^7(p, n)Be^7$ Reaction

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Using previously described methods [1], further polarization measurements have been performed on neutrons from the $Li^7(p, n)Be^7$ reaction. Angular distribution measurements of the polarization (P_n) were carried out at proton energies of 2.2, 2.6, and 3.0 MeV, covering angular ranges (laboratory system) of 30° to 70°, 30° to 115°, and 30° to 70° respectively. For the neutrons emitted at 50°, additional measurements have been made on the energy dependence of P_n between 1.95 and 3.00 MeV proton energy. The angular distribution data indicate that the polarization reaches a maximum in the vicinity of 60°. At a proton energy of 2.6 MeV, the polarization is near zero for angles of 105° and 115°, suggesting that two states with the same initial channel spin and $l_1 + l_2 \geq 2$ are contributing to the cross-section. As a function of energy, P_n at 50° has a minimum near 2.45 MeV and increases with decreasing proton energy to a maximum value of about 0.5 at 2.1 MeV, below which it decreases abruptly. For energies below 2.5 MeV, the observed variation with energy of P_n is similar to that calculated assuming the reaction proceeds primarily via a 3^+ and a 2^- state in Be^8. If the level parameters which fit the total cross-section in this energy region are used, the calculations can be brought into qualitative agreement with experiment only by drastically altering the hard sphere phases near threshold. Fair agreement can also be obtained by introducing a 1^- level near threshold.

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