Entrance channel effects in the decay of the compound nucleus ^{80}Sr*

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The measured light charged particle spectra from the heavy ion induced fusion reactions have been found to have serious discrepancies from the predictions of the standard statistical model [1, 2, 3]. Measured spectra have been characterised as having lower energy than predicted. However the deviations from the predictions have been found to depend on the symmetry of the entrance channel [4, 5]. We have planned a systematic study of the entrance channel effects. Here we report our results for the compound nucleus ^{80}Sr formed through the asymmetric reaction ^{16}O+^{64}Zn at 95 MeV and the relatively symmetric reaction ^{32}S+^{48}Ti at 125 MeV. Both of these systems lead to the same compound nucleus ^{80}Sr with the same value of $\mathbf{l_{max}}$= 43$\hbar$

The spectra from the ^{16}O+^{64}Zn reaction, as shown in Fig.1, are in agreement with the predictions of the statistical model using rotating liquid drop model values of moment of inertia and optical model transmission coefficients for the respective inverse absorption channels . However the spectra in the case of ^{32}S+^{48}Ti reaction, as shown in Fig.2, are not in agreement with such calculations. In order to explain the experimental spectra in case of the symmetric ^{32}S+^{48}Ti system, we need to use the HICOL predicted value for l=30$\hbar$ as shown in Fig.3. It seems as the symmetry of the system increases, the upper limit of the effective l-values contributing to the fusion is lowered. For the symmetric systems the formation time is larger as compared to the decay time, hence the higher l values may decay before the compound nucleus is formed. The present study shows that statistical model which assumes the formation time to be much smaller than the decay time predicts the evaporation spectra for the asymmetric systems reasonably well, but in the case of the symmetric systems having longer formation times the dynamical effects seem to play an important role in the decay of the compound nucleus.

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