STUDY OF COMPOUND NUCLEUS ^{220}Th* USING THE DYNAMICAL CLUSTER-DECAY MODEL

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The compound nucleus (CN) ^{220}Th*, formed through various entrance channels ^{16}O+^{204}Pb, ^{40}Ar+^{180}Hf, ^{48}Ca+^{172}Yb, ^{82}Se+^{138}Ba and ^{124}Sn+^{96}Zr, is studied over a range of different CN excitation energies E*=30-60 MeV. Furthermore, ^{220}Th* is observed to undergo asymmetric fission. We have made our calculations using the Dynamical Cluster-decay Model (DCM). The fragmentation potential for ^{220}Th* calculated for the "hot, compact" or "cold, elongated" configurations, prefers the "hot, compact" configuration since it supports the above noted observed asymmetric fission distribution. Interestingly, the potential energy minima in fragmentation potential energy surface, which correspond to the cold-fusion reactions with "hot, compact" configurations, include all the above noted target-projectile combinations used in experiments. For the decay study of ^{220}Th*, using the DCM, we have first calculated the total ER cross-section σ_{ER} ($= \sum_{x=1}^{5} \sigma_{xn}$) at a fixed neck length parameter ΔR, the only parameter of the model. We find that the reaction ^{16}O+^{204}Pb (the most asymmetric one) has the largest ΔR which corresponds to the smallest reaction time and ^{124}Sn+^{96}Zr reaction has the smallest ΔR, correspondingly the largest reaction time. Next, we have fitted individually the measured ER channels, i.e., the 3n, 4n and 5n channels over the energy range E*~34-46 MeV for ^{40}Ar+^{180}Hf, ^{48}Ca+^{172}Yb and ^{82}Se+^{138}Ba. We find that only the 3n and 5n decay cross sections could be fitted almost exactly as pure CN decays, with 4n channel requiring non-compound nucleus (nCN) contribution, treated as the quasi-fission-like process, and is also in nice agreement with the experimental data.