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Entrance Channel Dynamics of Hot and Cold Fusion Reactions Leading to Superheavy Elements[1] SAIT UMAR, VOLKER OBERACKER, Vanderbilt University — One of the most fascinating research areas involving low-energy nuclear reactions is the search for superheavy elements. Experimentally, two approaches have been used for the synthesis of these elements, one utilizing closed shell nuclei with lead-based targets (cold-fusion), the other utilizing deformed actinide targets with ^{48}Ca projectiles (hot-fusion). In this talk we investigate the entrance channel dynamics for the reactions ^{70}Zn + ^{208}Pb and ^{48}Ca + ^{238}U using the fully microscopic time-dependent Hartree-Fock (TDHF) theory coupled with a density constraint [1-3]. We calculate excitation energies and capture cross-sections relevant for the study of superheavy formations. We discuss the deformation dependence of the ion-ion potential for the ^{48}Ca + ^{238}U system and perform an alignment angle averaging for the calculation of the capture cross-section. The results show that this approach can generate results in good agreement with experiment and other theories.

[1] Umar, Oberacker, PRC 74, 061601(R) (2006).
[2] Umar, Oberacker, EPJA 39, 243 (2009).
[3] Umar, Maruhn, Itagaki, and Oberacker, PRL 104, 212503.

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