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Molecular structures in slow nuclear collisions

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I will report on a quantitative study of the sub-Coulomb fusion of astrophysically important heavy-ion collisions, such as $^{16}\text{O} + ^{16}\text{O}$ and $^{12}\text{C} + ^{12}\text{C}$. It is carried out using wave-packet dynamics. The low-energy collision is described in the rotating center-of-mass frame within a nuclear molecular picture [1]. A collective Hamiltonian drives the time propagation of the wave-packet through the collective potential-energy landscape that is calculated with a realistic two-center shell model [2-4]. Among other preliminary results, the theoretical sub-Coulomb fusion resonances for $^{12}\text{C} + ^{12}\text{C}$ seem to correspond well with observations. The method appears to be useful for expanding the cross-section predictions towards stellar energies.

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