

Effect of Pauli repulsion on fusion

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The Pauli exclusion principle induces a repulsion between composite systems of identical fermions such as colliding atomic nuclei. Our goal is to study how heavy-ion fusion is impacted by Pauli repulsion. We propose a new microscopic approach, the density-constrained frozen Hartree-Fock method, to compute the bare potential including the Pauli exclusion principle exactly. Coupled-channel calculations show a reduction of fusion cross-section around the barrier due to Pauli repulsion, improving the agreement with the experimental fusion cross-sections. Pauli repulsion provides a plausible (at least partial) explanation of the long-standing deep sub-barrier fusion hindrance problem.