

Clusters, halos and S-factors in Fermionic molecular dynamics

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Light nuclei are studied within the Fermionic Molecular Dynamics model. An effective interaction based on the Argonne V18 interaction is used for all nuclei. Short-range central and tensor correlations are treated explicitly using a unitary correlation operator. The evolution of cluster structures and halos with increasing neutron or proton number or excitation energy is discussed. The astrophysical S-factor is calculated for ${}^3\text{He}(\alpha,\gamma){}^7\text{Be}$ radiative capture reaction in a fully microscopic fashion. Other applications are the Hoyle type states in ${}^{12}\text{C}$ above the 3 alpha threshold or the two proton halo state in ${}^{17}\text{Ne}$.