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Fusion hindrance in light- and heavy-systems

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The phenomenon of hindrance in sub-barrier heavy-ion fusion will be introduced and several experimental evidences show that it is a general phenomenon. It is recognized in many cases by the trend of the logarithmic slope of excitation function and of the S factor at low energies. The comparison with standard Coupled-Channels calculations is a more quantitative evidence for its existence.

Hindrance is observed in light systems, independent of the sign of the fusion Q-value, with different features. In the case of the $^{12}\text{C} + ^{30}\text{Si}$ system the hindrance effect is small but it is clearly recognized. Near-by cases show evidence for systematic behaviors. A very recent experiment has concerned the lighter case $^{12}\text{C} + ^{24}\text{Mg}$ where hindrance shows up clearly, because a maximum of the S-factor appears already at a relatively high cross section $\sigma = 1.6$ mb. The consequences for the dynamics of stellar evolution have to be clarified by further experimental and theoretical work.

Possible interpretations of hindrance will be shortly illustrated, including a recent suggestion on the possible influence of Pauli blocking in the fusion dynamics.

Indeed in many heavier systems the hindrance effect has been recognized with different features depending on the various couplings to the inelastic and transfer channels. When transfer channels with positive Q-value are available, their effect is often important at low energies where it can compete with hindrance.

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