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Breakup of weakly bound nuclei and its influence on fusion

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In this talk it will be discussed some important features of the breakup of weakly bound nuclei, at energies close to the Coulomb barrier, and its effect on the fusion cross section. Contrary to what was assumed for a long time, recently it has been observed experimentally that at sub-barrier energies transfer processes followed by the breakup of stable weakly bound projectile predominates over the direct breakup. It will be shown how important is the interference between the nuclear and Coulomb components of the breakup and how the cross sections of these components increase when the target mass or charge increases. The effects of the breakup on the fusion cross section are of static and dynamical types, which nowadays can be disentangled. Recent systematic results have shown that the dynamics effects due to breakup and transfer processes enhance the complete fusion cross section at sub-barrier energies and suppress it at energies above the barrier for stable and neutron-halo nuclei. Some controversy exists for the fusion of proton-halo nuclei. The presently available results for the suppression factor of the complete fusion, for a given stable weakly bound projectile, seem to be independent of the target. It will be discussed whether this behaviour is due to the predominance of delayed breakup, which can not affect fusion, or simply because this conclusion was obtained from systematic results including only relatively heavy targets, or both of them. Some experimental challenges and the main open aspects in this field will also be discussed.

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