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Neutron Scattering, (n,xn)-reactions, (n,chpart) experiments

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With increasing neutron energy additional reaction channels open up for neutrons. If the neutron kinetic energy is higher than the first excited state of the target nucleus, inelastic scattering starts to become important. This process leads to an efficient energy loss of the neutrons in contrast to elastic scattering where the neutron only transfers a small fraction of its momentum to the much heavier recoiling nucleus. The emission of light charged particles like hydrogen or helium isotopes can be energetically possible even for small neutron kinetic energies. These reactions can be important for the nucleosynthesis in the cosmos and also in nuclear reactors, where the helium emitted in (n,alpha) reactions can lead to swelling in the fuel elements. If the neutron kinetic energy is above the neutron separation energy of the target (n,2n) reactions can occur, that set free additional neutrons. I will present several examples of measurements of the above mentioned reactions and discuss their merits and advantages.