The evolution from quasi-elastic to deep inelastic processes and its connection to fusion

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Multinucleon transfer processes link two regimes, quasi elastic and deep inelastic, characterized by small and large total kinetic energy loss, respectively. There is a smooth transition between these two regimes which depends, among various observables, on the bombarding energy and number of transferred nucleons [1]. Nuclear structure properties strongly affect the behaviour of the binary system and are tightly correlated with other competing channels, fusion in particular [2,3].

Experimental and theoretical aspects of multinucleon transfer reactions have been investigated in the last decade in a variety of systems, involving nuclei of closed shell or superfluid character. Significant advances have been achieved with the development of high resolution and high efficiency experimental set-up's, in particular the last generation large solid angle magnetic spectrometers, through which one could unambiguously detect in mass and charge the nuclei produced in multi-neutron and multiproton transfer reactions [4]. The application of semiclassical theory allowed to properly study how single particle and more complex degrees of freedom (e.g. pair modes) act in the transfer process and how these are connected with the competing reaction channels, like fusion.

In the present talk I will discuss some of these recent achievements.

[1] L. Corradi, G. Pollarolo, S. Szilner, J. of Phys. **G36**, 113101 (2009)
[2] Fusion06: Int. Conf. on *Reaction Mechanisms and Nuclear Structure at the Coulomb barrier*, S.Servolo (Venezia), Italy,19-23 March 2006, AIP Proceedings Series, Vol. 853, Melville (New York), L. Corradi *et al.* eds.
[3] Fusion08 : Int. Conf. on *New Aspects of Heavy Ion Collisions Near the Coulomb Barrier*, Chicago (USA), September 22-26, 2008, AIP Proceedings Series, Vol. N. 1098 (2009), Melville (New York), K.E. Rehm *et al* eds.
[4] S. Szilner et al, Phys. Rev. **C76**, 024604 (2007)