

## Quasi-elastic reactions : an interplay of the reaction dynamics and the nuclear structure

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A significant amount of experimental data on heavy ion transfer reactions collected in the last decade have been shown to be quantitatively described in reaction model which include elementary degrees of freedom, surface vibrations and single particles [1]. The revival of transfer reaction studies benefited from the construction of the new generation large solid angle spectrometers based on trajectory reconstruction that reached an unprecedented efficiency and selectivity. The coupling of these spectrometers with large  $\gamma$  arrays allowed the identification of individual excited states, their population pattern and decay modes via particle- $\gamma$  coincidences. In transfer reactions one of the most interesting item is how single particle and more complex degrees of freedom act in the transfer process. Via gamma-particle coincidences it is now experimentally possible to measure the transfer strength to specific final states with high efficiency.

In the present talk aspects of fragment- $\gamma$  coincidence studies in  $^{90}\text{Zr}+^{208}\text{Pb}$  [2],  $^{40}\text{Ca}+^{96}\text{Zr}$  [3], and  $^{40}\text{Ar}+^{208}\text{Pb}$  [4] will be discussed. In particular, we will report about states of particle-phonon and pair-phonon character, supporting the idea that the relevant degrees of freedom acting in the reaction dynamics define the strength distribution of individual states in final reaction products.

[1] L. Corradi, G. Pollarolo and S. Szilner, *J. of Phy. G* **36** (2009) 113101.

[2] S. Szilner *et al.*, AIP, EXON09 Conference Proceedings **1224**, 185-194, 2010.

[3] S. Szilner *et al.*, *Phys. Rev. C* **76** (2007) 024604.

[4] S. Szilner *et al.*, *Phys. Lett. B*, submitted.