Subbarrier fusion and barrier distributions of ^{48}Ca + ^{90,96}Zr

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Near-barrier excitation functions have been measured for the two systems ^{48}Ca + ^{90,96}Zr, using 2-5 pnA ^{48}Ca beams from the XTU Tandem accelerator, 50-100μg/cm^2 zirconium oxide targets and the beam electrostatic deflector - TOF telescope set-up. Beam energies were in the range 133-170 MeV range and the evaporation residues were measured in small 0.75 MeV energy steps with good statistical accuracy, so to be able to extract the barrier distributions from the second derivatives of the excitation functions. Both barrier distributions (not shown in this abstract) have clear structures, and the one for ^{48}Ca + ^{96}Zr tends to be wider. The data analysis is in progress by coupled-channel calculations performed by the code CCFULL. One notices the dominant influence of Zr collective excitations (quadrupole and octupole) on fusion cross sections. It is also already clear from a comparison (see Figure) with the close systems ^{40}Ca + ^{90,96}Zr studied previously [1], that little influence of neutron pick-up channels on subbarrier fusion may be deduced for the ^{48}Ca + Zr cases, in agreement with the systematics of Q-values for those transfer channels, while the isotopic trends show that ^{40}Ca + ^{96}Zr has by far larger subbarrier fusion cross sections than the other three systems, thus reinforcing the interpretation of such enhancements as being due to neutron transfer couplings.

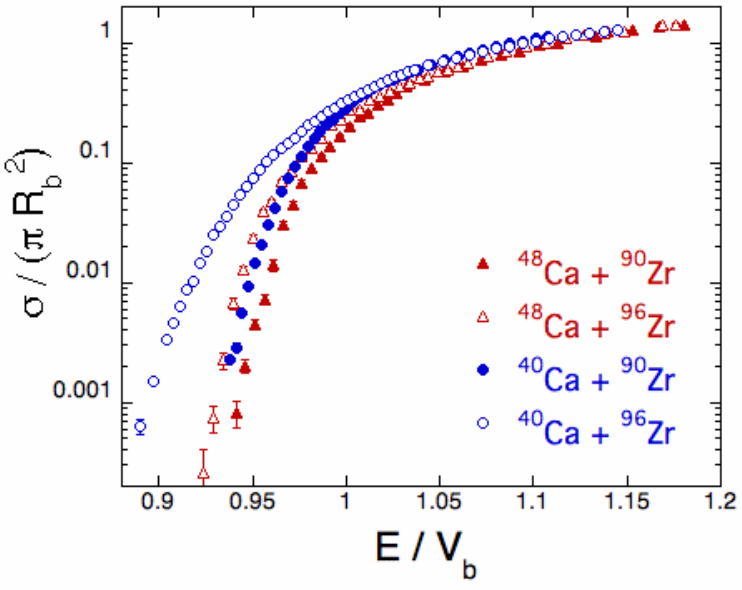

Figure 1: *Reduced fusion excitation functions for ^{40,48}Ca + ^{90,96}Zr.*

[1] H.Timmers et al., Phys. Lett. B399 (1997) 35; Nucl. Phys. A633 (1998) 421