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Nuclear response to two-neutron transfer via the (18O,16O) reaction

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A study of the structure of different nuclei was pursued at the Catania INFN-LNS laboratory by the (18O,16O) two-neutron transfer reaction at 84 MeV incident energy. The experiments were performed using several solid targets from light (9Be, 11B, 12,13C, 16O, 28Si) to heavier ones (58,64Ni, 120Sn, 208Pb). The 16O ejectiles were detected at forward angles by the MAGNEX magnetic spectrometer. Exploiting the large momentum acceptance (20%) and solid angle (50 msr) of the spectrometer, energy spectra were obtained with a relevant yield up to about 20 MeV excitation energy, with an energy resolution of about 100 keV. Several known low lying and resonant states of the product nuclei have been observed in the energy spectra . A common feature observed with light nuclei is the appearance of unknown resonant structures at for example 10.5 and 13.6 MeV in 15C and 16 MeV in 14C. The strong population of these latter together with the measured width can reveal the excitation of a collective mode connected with the transfer of a pair. Considerations based on kinematical matching conditions and on the shell configuration of the explored nuclei explain why such a mode is so excited in such reactions. In addition the measured angular distributions seems to indicate a transfer of a correlated neutron pair in L = 0 configuration, compatible with the Giant Pairing Vibration mode. Theoretical calculations have been performed in order to estimate the contribution of the two neutrons break-up.

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