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Evidence of correlated 2*n* transfer in the $^{12}C(^{18}O,^{16}O)^{14}C$ reaction

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A study of the ($^{18}O,^{16}O$) two-neutron transfer reaction at 84 MeV incident energy was pursued at the Catania INFN-LNS laboratory. The experiments were performed on several solid targets from light (^{9}Be, ^{11}B, $^{12,13}C$, ^{16}O, ^{28}Si) to heavier ones ($^{58,64}Ni$, ^{120}Sn, ^{208}Pb). The ^{16}O ejectiles were detected at forward angles by the MAGNEX magnetic spectrometer [1]. 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 [2]. The application of the powerful trajectory reconstruction technique did allow to get energy spectra with energy resolution of about 150 keV and angular distributions with angular resolution better than 0.3°. In the energy spectra, several known low lying and resonant states of the product nuclei have been observed.

The measured absolute cross-section angular distributions are analyzed by Exact Finite Range Coupled Reaction Channel calculations based on a parameter free double-folding optical potential [3]. The form factors for the ($^{18}O,^{16}O$) reaction are extracted within an extreme cluster and independent particles scheme with shell model derived coupling strengths. The results show that the measured cross-sections are accurately described for the first time without the need of any arbitrary scaling factor.

This is a completely new result that opens the door to the use of the ($^{18}O,^{16}O$) as powerful tools for quantitative spectroscopic studies of single-particle and pair configurations in nuclear states. As a consequence, the controversial concept of spectroscopic factor for two-neutron pair states can be better defined.

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