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Study of elastic and inelastic scattering and one-nucleon transfer reactions for the system $^{18}O+^{48}Ti$ within the NUMEN project

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The $^{18}O+^{48}Ti$ reaction was studied at 275 MeV incident energy for the first time under the NUMEN [1] experimental campaign with the main goal of investigating the $^{18}O(^{48}Ti,^{48}Ca)^{18}Ne$ double charge exchange (DCE) process. The measurements were performed at the INFN-LNS in Catania, using the MAGNEX large acceptance magnetic spectrometer [2]. To fully understand the direct meson-exchange DCE mechanism, the contribution of other competing processes leading to the same final states should be quantified. In the context of this multi-channel approach, the study of the elastic and inelastic scattering is fundamental, because the former gives access to the optical potential, while the latter allows to investigate the nuclear deformations. Moreover, the analysis of such channels permits to deduce the initial state interaction, which is an essential ingredient for the description of all the nuclear transitions involved in the reaction network. To this extent, the elastic and inelastic experimental cross section angular distributions were deduced and theoretically analyzed within the distorted-wave Born approximation and the coupled channel formalisms in order to explore the role of the couplings to the low-lying excited states of both projectile and target. Recent results on the analysis of the one-proton [3] and one-neutron transfer reactions will be also presented.

References
[1] F. Cappuzzello et al., Eur. Phys. J. A 54 (2018) 72.
[2] F. Cappuzzello et al., Eur. Phys. J. A 52 (2016) 167.
[3] O. Sgouros et al., Phys. Rev. C 104 (2021) 034617.

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