Measurement of isospin mixing in ^{80}Zr* at finite temperature

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The issue of isospin mixing in N≈Z nuclei, related to the breaking of isospin symmetry due to Coulomb interaction, as well as other isospin-related phenomena has been subject of renewed interest in recent years [1]. It has been predicted that isospin mixing probability should increase with nuclear mass and temperature [2]. It is expected that the mixing increases up to T≈1-2 MeV and then decreases because the excited compound nucleus lifetime is too short for the relatively weak Coulomb interaction [2]. This prediction has been confirmed by several measurements of isospin mixing at finite temperature, limited up to now to the A=26-60 mass region [3].

A useful tool to study the degree of isospin purity of a state is to observe an isospin forbidden transition, as for example the E1 gamma decay from a compound nucleus populated in the I=0 channel where gamma decay is allowed only due to isospin mixing. In order to isolate isospin effects, statistical decay of two compound nuclei with the same mass and temperature but I≠0 and I=0 should be studied and compared. In addition, the measurement of the Giant Dipole Resonance decay of the compound nucleus is now the only available tool to study I=0 nuclei with A>60, since these nuclei close to the proton drip line are difficult to populate at zero temperature. The results obtained at finite temperature can then be extrapolated to the ground state.

Two reactions populating a compound nucleus of mass A≈80 with I≠0 and I=0 entrance channel have been performed at Laboratori Nazionali di Legnaro (Italy) with the combination of HECTOR (array of 8 BaF_2 scintillators), GARFIELD (apparatus of 96 E-ΔE telescopes) and 32 PHOSWICH (plastic scintillators combined with CsI) detectors.

Results of the statistical model analysis for the reference reaction, ^{37}Cl+^{44}Ca, will be presented. These results have been used in the analysis of ^{40}Ca+^{40}Ca statistical decay where isospin effects inhibit the E1 Giant Dipole Resonance decay.

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