Investigating isospin mixing via B($E1$) measurements in ^{67}As and ^{67}Se mirror pair

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In a recent fusion-evaporation experiment performed at Argonne National Laboratory with Gammasphere, Microball and the Neutron Wall, analogue B($E1$) reduced transition probabilities in the mirror pair ^{67}As and ^{67}Se were obtained for the first time, via the lifetime measurement of the $9/2^+_1$ states. In general, a difference in the reduced strengths of mirror $E1$ transitions is believed to be the experimental signature of isospin mixing. In fact, if isospin symmetry holds and in the long-wavelength limit, analogue $E1$ transitions in mirror nuclei should be purely isovector in nature and thus exhibit equal reduced strengths. Isospin symmetry breaking is believed to induce an isoscalar term which combines with the isovector term with opposite sign in mirror nuclei.

The $9/2^+_1$ states de-excite in both nuclei to lower lying $7/2^-_2$, $7/2^-_1$ and $5/2^-_1$ states via two $E1$ and one $M2$ transitions. From the comparison of the two pairs of $E1$ transitions, a clear difference can be seen only in the B($E1$) strengths of the analogue $E1$ transitions de-exciting to the $7/2^-_2$ state, but not those de-exciting to the $7/2^-_1$ state. While the reason for this behaviour is not entirely clear, this observation may be related to the structure of the excited states involved, and can be compared with recent shell model calculations [1]. These results will be discussed with reference to theoretical predictions of isospin mixing [2].

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