ISOSPIN SYMMETRY BREAKING IN MIRROR NUCLEI ^{23}MG-^{23}NA

Alberto Boso, Università degli Studi di Padova and INFN Padova, Padova, Italy

A. Boso[1,2], S.M. Lenzi[1,2], F. Recchia[1,2], S. Aydin[13], M.A. Bentley[8], J. Bonnard[2], B. Cederwall[6], E. Clement[9], G. de France[9], A. Di Nitto[5], A. Dijon[9], M. Doncel[6], F. Ghazi-Moradi[6], A. Gottardo[3], T. Henry[8], T. Huyuk[7], G. Jaworski[12], P.R. John[1,2], I. Kuti[4], B. Melon[10], D. Mengoni[1,2], C. Michelagnoli[1,2], V. Modamio[3], D.R. Napoli[3], B.M. Nyako[4], J. Nyberg[10], M. Palacz[12], J.J. Valiente-Dobon[3]

1 Dipartimento di Fisica e Astronomia Università degli Studi di Padova, Padova, Italy.
2 INFN, Sezione di Padova, Padova, Italy.
3 INFN, Laboratori Nazionali di Legnaro, Legnaro (Padova) Italy.
4 Institute of Nuclear Research (ATOMKI) of Hung. Acad. Sciences, Debrecen, Hungary.
5 Dipartimento di Scienze Fisiche and INFN, Sezione di Napoli, Napoli, Italy.
6 Royal Institute of Technology, Stockholm, Sweden
7 IFIC-CSIC, Valencia, Spain.
8 University of York, York, United Kingdom.
9 GANIL, Caen, France.
10 Dipartimento di Fisica and INFN, Sezione di Firenze, Firenze, Italy.
11 Uppsala University, Uppsala, Sweden.
12 Warsaw University, Warszawa, Poland.
13 Aksaray Universitesi, Aksaray, Turkey.

The isospin symmetry of the nuclear interaction implies that the level schemes of mirror nuclei should be identical. The differences between the excitation energy of analogue states, called Mirror Energy Differences (MED), are therefore an important signature of isospin symmetry breaking.
Although the Coulomb interaction is the main responsible of this asymmetry, it has been pointed out that isospin symmetry breaking (ISB) terms could arise from the residual nuclear interaction [1]. Systematic studies in the $f_{7/2}$ shell have shown that MED constitute a very delicate probe of the nuclear structure, being sensitive to the nucleon alignment, the radius variation with increasing J and the wavefunction configuration [2]. The possibility to extract such informations relies on the good amount of experimental data and the excellent shell model description of the structure of these nuclei [3]. Another mass region where the shell model reproduces with good accuracy the experimental data is the lower *sd* shell.
In this contribution we present the results of an experiment performed in GANIL to study isospin symmetry breaking in mirror nuclei ^{23}Mg–^{23}Na up to high spin. Excited states in the nuclei of interest were populated via the ^{12}C(^{16}O,αn) and ^{12}C(^{16}O,αp) reactions respectively and the experimental setup composed of EXOGAM-DIAMANT-NEUTRON WALL permitted to cleanly select the channel of interest, create γ-γ matrices and reconstruct the level schemes.
The experimental MED values are compared with state-of-the-art shell model calculations. Recently developed effective interactions that naturally take into account the nuclear ISB term are used. This permits to enlighten several nuclear structure properties, such as the way in which the nucleons alignment proceeds, the radius variation with J, the role of the spin-orbit interaction and the importance of isospin symmetry breaking terms of nuclear origin.

REFERENCES

[1] A.P. Zuker, S.M. Lenzi, G. Martinez-Pinedo and A. Poves, Phys. Rev. Lett. 89, 142502 (2002).
[2] S.M. Lenzi et al., Phys. Rev. Lett. 87, 122501 (2001).
[3]M.A. Bentley and S.M. Lenzi, Prog. Part. Nucl. Phys. 59, 497-561 (2007)