

Giant Dipole Radiation and Isospin Mixing in Hot Nuclei with $A=32-60$ *

E. Wójcik¹, M. Kicińska-Habior¹, O. Kijewska¹, M. Kowalczyk¹, M. Kisieliński^{2,3},
J. Choiński²

¹ Institute of Experimental Physics, Warsaw University, Poland; ² Heavy Ion Laboratory, Warsaw University, Poland; ³ Sołtan Institute of Nuclear Studies, Świerk, Poland

Statistical decay of the Giant Dipole Resonance (GDR) built on excited states populated in heavy-ion fusion reactions may be used as a tool to determine the isospin mixing probability α^2 in hot self-conjugate nuclei [1]. During the last decade the temperature dependence of the isospin mixing probability in highly excited light ^{26}Al and ^{28}Si compound nuclei have been studied using this method and a strong decrease of α^2 over the excitation energy range of $E_x = 20 - 65$ MeV was found [2], in agreement with theoretically predicted restoration of isospin symmetry in hot nucleus. For nuclei in the ground state, the dependence of the isospin mixing probability on the mass number A and the atomic number Z was suggested. An increase of α^2 with increasing mass number A (atomic number Z) may be expected also for nuclei at finite temperatures. In order to investigate the dependence of the isospin mixing probability on the mass number A of highly excited self-conjugate nuclei we have studied statistical GDR decay of ^{32}S , ^{36}Ar , ^{44}Ti and ^{60}Zn compound nuclei formed at similar excitation energies (temperatures). Data for lower mass nuclei ^{26}Al and ^{28}Si have been adopted from Ref. [2].

In our experiments the self-conjugate compound nuclei were formed in the entrance channel with the isospin $T=0$. We have also measured the reaction populating neighboring compound nuclei at similar excitation energy, but with the $T \neq 0$. The γ -ray yield in nuclei with $N \neq Z$ does not depend much on isospin mixing. It allowed to determine the GDR parameters in those nuclei in a way less dependent on the isospin mixing. Thus we have extracted the amount of isospin mixing in the $T=0$ compound nuclei by comparing the measured and calculated ratios of γ -ray cross-sections (above $E_\gamma = 15$ MeV) for reactions in which $T=0$ and $T \neq 0$ neighboring compound nuclei were formed at similar excitation energies. Experiments were performed using beams from the Warsaw Cyclotron and self-supporting isotopic enriched targets. Gamma rays from the decay of the compound nuclei studied were measured with the multidetector JANOSIK set-up.

Measured high-energy γ -ray spectra from the decay of the compound nuclei were fitted with CASCADE statistical model calculations, under the assumption that the Coulomb spreading width is the same in neighboring nuclei at a given excitation energy. Extracted GDR parameters for the nuclei studied, Coulomb spreading width and the isospin mixing probability and their dependence on the mass number A will be discussed.

* This work was partly supported by the Polish State Committee for Scientific Research (KBN Grants No. 1 P03B 160 29)

[1] M.N. Harakeh *et al.*, Phys. Lett. B 176, 297 (1986)

[2] J.A. Behr *et al.*, Phys. Rev. Lett. 70, 3201 (1993)