Shape Transitional Nuclei: What can we learn from the Yrare States?

J F Sharpey-Schafer§¶†, S M Mullins†, R A Bark†, E Gueorguieva†, J Kau†, F Komati†, J J Lawrie†, P Maine§†, A Minkova#, S H T Murray†, N J Ncapayi†, P Vymers§

§ University of Western Cape, Department of Physics, P/B X17, Bellville, ZA-7535 South Africa.
¶ University of Zululand, Department of Physics and Engineering, P/B X1001, Kwa Dlangezwa, ZA-3886 South Africa
† iThemba Laboratory for Accelerator Based Sciences, PO Box 722, Somerset-West, ZA-7129 South Africa.
# Faculty of Physics, St. Kliment Ohridski University of Sofia, Sofia 1164, Bulgaria.

Abstract

The rapid shape changes over small ranges of nucleon number in transitional nuclei bring different single particle orbitals close to the Fermi Surface. For these nuclei, structures with different shapes can coexist and the softness of the nucleus to β and γ vibrations can also be affected. Exotic shapes have also been predicted to occur for some nuclei, for example, tetrahedral shapes have been predicted to occur for nuclei near N = 90 and Z = 64, 70. Hence experimental data is required on as many levels as possible and as far from the yrast line as can be reached: “complete spectroscopy”.
The low spin structure of nuclei near N = 90 will be reviewed and the results of our measurements on the yrare states in ^{152,154,155}Gd, using (α,xn) reactions and the AFRODITE γ-ray spectrometer, will be presented.