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Evolution to neutron rich isotopes in the fine structure of the Isoscalar Giant Monopole Resonance in 40,42,44,48Ca using alpha inelastic scattering at zero degrees

Previous studies have shown that fine structure in the excitation energy spectra of nuclear giant resonances can be attributed to different physical processes. For example, characteristic energy scales of the fine structure for the Isoscalar Giant Quadrupole Resonance (ISGQR) arise mainly from the collective coupling of the ISGQR to low-lying surface vibrations, while on the other hand it has been shown that Landau damping is the main mechanism leading to the fine structure phenomenon in the isovector giant dipole resonance. It is important to determine which processes are responsible for the fine structure in the ISGMR, particularly in the 40,42,44,48Ca isotope chain with its systematic increase in neutron number. Moreover, study of the ISGMR is of special significance because knowledge of its centroid energy and width provide direct information on nuclear incompressibility. As part of the longstanding WITS/IKP Darmstadt/iThemba collaborative program on the investigation of properties of Nuclear Giant Resonances, experiments were performed using the Separated Sector Cyclotron of iThemba LABS, together with the K600 magnetic spectrometer using inelastic scattering of 200 MeV alpha particles at zero and four degrees (0o and 4o) from 40,42,44,48Ca for measurements in the region of ISGMR with a good energy resolution of 86 keV (FWHM). In addition, following an autocorrelation analysis, J π = 0+ level densities can also be extracted. Preliminary results will be presented.

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