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Proton emission in neutron deficient nuclei

The ground state properties of neutron deficient nuclei in the region from I to Bi with Z = 53 -83 and N = 56 -102 has been studied within the relativistic mean field formalism [B.D. Serot et al., Adv. Nucl. Phys. 16, 1 (1986); Y.K. Gambhir et al., Ann. Phys. 198, 132 (1990)] with NL3, DDME-1, DDME-2 parameterizations, with deformed consideration of nuclei. The calculated binding energies are in good comparison with experimental data. The negative value of neutron skin thickness shows that radial distribution of proton is extended compared to that of neutron and small thickness of aggregated protons in the outer part of nucleus is loosely bound which is prone to p-emission. The quasi bound states from which the p-emission is probable are determined. Further, the proton decay half-lives are calculated using WKB approximation, by taking into account the experimental Q-values. The total interaction potential comprises of Coulomb, nuclear and centrifugal potentials and the nuclear potential is obtained by using double folding method with realistic M3Y effective nucleon-nucleon interaction and spherical equivalent densities obtained from deformed densities. The results present that decay half-lives are highly sensitive to orbital angular momentum (l) of outgoing proton. The l-values are chosen to be in agreement with available experimental data. The calculated half-lives for different neutron deficient nuclei are in consonance with experimental data with both spherical [T. Sahoo et al., Chinese Phys. C (accepted)] and deformed nuclei consideration of nuclei, suggesting that deformation appears to have no role in influencing the 1p-emission.

Primary author: Dr KAUR, Manpreet (1Institute of Physics, Bhubaneswar -751005, India, 2Homi Bhabha National Institute, Anushakti Nagar, Mumbai - 400085, India)

Co-authors: Ms SAHOO, Trupti (Veer Surendra Sai University of Technology, Burla –768018, India); Prof. PATRA, Suresh Kumar (1Institute of Physics, Bhubaneswar -751005, India, 2Homi Bhabha National Institute, Anushakti Nagar, Mumbai - 400085, India)

Presenter: Dr KAUR, Manpreet (1Institute of Physics, Bhubaneswar -751005, India, 2Homi Bhabha National Institute, Anushakti Nagar, Mumbai - 400085, India)

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