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Symmetry energy and neutron pressure of finite nuclei using the relativistic meanfield formalism

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In this theoretical study, we establish a correlation between the neutron skin thickness and the nuclear symmetry energy for the even-even isotones for magic neutron N = 20, 40, 82, 126, 172 (expected) within self-consistent relativistic mean-field formalism for non-linear NL3* and density-dependent DD-ME2 parameter sets [1-3]. The local density approximation is used to formulate the symmetry energy, and its co-efficient, namely, neutron pressure of finite nuclei over the isotonic chains [4]. We find a few moderate signatures of pick and/or depth over the isotonic chains at and/or near the proton magic for symmetry energy and neutron pressure, which is a manifestation of the persistence of shell/sub-shell closure. Furthermore, we show the symmetry energy as a function of neutron-proton asymmetry, which results in similar behavior as persisted in the mass-dependence curve. The obtained results are of considerable importance since due to shell closure over the isotonic chain, will act as awaiting point in nucleosynthesis of the r-process. These results are also further strengthened the experimental investigations for the existence of magicity in the drip-line region of the nuclear chart [1].

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