Temperature Dependence of the Volume and Surface Contributions to the Nuclear Symmetry Energy within the Coherent Density Fluctuation Model

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The temperature dependence of the volume and surface components of the nuclear symmetry energy (NSE) and their ratio is investigated in the framework of the local density approximation. The results of these quantities for finite nuclei are obtained within the coherent density fluctuation model (CDFM) and the Skyrme energy-density functional for nuclear matter. The CDFM weight function is obtained using the temperature-dependent proton and neutron densities calculated through the HFBTHO code that solves the nuclear Skyrme-Hartree-Fock-Bogoliubov problem by using the cylindrical transformed deformed harmonic-oscillator basis. We present and discuss the values of the T-dependent volume and surface contributions to the NSE and their ratio obtained for the Ni, Sn, and Pb isotopic chains around double-magic ^{78}Ni, ^{132}Sn, and ^{208}Pb nuclei. The results are compared with estimations made previously for zero temperature showing the behavior of the NSE components and their ratio [1]. The comparison is made also with our previous results for the T-dependent NSE [2]. We confirm the existence of "kinks" at $T = 0$ MeV for the double closed-shell nuclei ^{78}Ni and ^{132}Sn and the lack of "kinks" for the Pb isotopes.

References

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