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Applying the Crystal Model Approach on Light Nuclei for Calculating Radii and Density Distribution

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Abstract : A new model, namely the crystal model, has been modified to calculate the radius and density distribution of light nuclei up to ^{8}Be. The crystal model has been modified according to solid-state physics, which uses the analogy between nucleon distribution and atoms distribution in the crystal. The model has analytical analysis to calculate the radius where the density distribution of light nuclei has obtained from analogy of crystal lattice. The distribution of nucleons over crystal has been discussed in a general form. The equation that has been used to calculate binding energy was taken from the solid-state model of repulsive and attractive force. The numbers of the protons were taken to control repulsive force, where the atomic number was responsible for the attractive force. The parameter has been calculated from the crystal model was found to be proportional to the radius of the nucleus. The density distribution of light nuclei was taken as a summation of two clusters distribution as in ^{6}Li=alpha+deuteron configuration. A test has been done on the data obtained for radius and density distribution using double folding for d+^{6,7}Li with M3Y nucleon-nucleon interaction. Good agreement has been obtained for both the radius and density distribution of light nuclei. The model failed to calculate the radius of ^{9}Be, so modifications should be done to overcome discrepancy.

Keywords : nuclear physics, nuclear lattice, study nucleus as crystal, light nuclei till to ^{8}Be
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