論文内容の要旨

Ab initio MCSM calculation for light exotic nuclei (軽いエキゾチック原子核の第一原理 MCSM 計算)

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The structure and low lying excited spectra of light exotic nuclei ^{10}Be, ^{12}Be, ^{7}Li and ^{9}Li has been investigated under Monte Carlo Shell Model calculation by employing UCOM potential. The unitary correlation operator method, which treat short range correlation by introducing two types of correlation operator — center correlation operator and tensor correlation operator, has been used in our calculation. Monte Carlo Shell Model calculation, as it can treat more wide variety of the states and large variation of nucleon number by decreasing Hamiltonian matrix dimension significantly comparing with conventional shell model calculation, is a suitable many-body calculation method for investigating exotic nuclei in a ab-initio way. We calculate ^{4}He in conventional shell model scheme as a testing for convergence of UCOM potential in the model space from emax=1 to emax=5 model space. Ground state and some low-lying state of ^{10}Be and ^{12}Be has been calculated by using UCOM potential in emax=3 (pf-shell) model space. We calculate the quadrupole momentum of first 2_1^+ state in ^{10}Be and ^{12}Be. The B(E2) value from $0_{g.s.}^+$ to 2_1^+ in both nuclei are calculated. We get 49.042 e^2fm^4 for B(E2;$0_{g.s.}^+ \rightarrow 2_1^+$) of ^{10}Be, which is close to experiment data 46(15) e^2fm^4. MCSM calculation with UCOM potential show a large excited energy of $1/2^-$ over $3/2^-$ and opposite energy level ordering of those two states comparing the results only two-body interaction included. MCSM results show agreement with experiment data because three-body force contribution is taken into account in UCOM potential.