Monte Carlo shell model calculations of neutron-rich nuclei

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In shell-model calculations in nuclear physics, we calculate many-body eigenstates in a model space composed of a finite number of single-particle states. In conventional shell-model calculations, eigenstates are obtained by the direct diagonalization of a Hamiltonian matrix in a finite-dimensional many-body space. Since the direct diagonalization is impossible in a large model space, we use the Monte Carlo shell model (MCSM) \cite{1}. In the MCSM, we approximate states with linear combinations of angular-momentum- and parity-projected deformed Slater determinants (MCSM bases) and diagonalize the Hamiltonian matrix in a small subspace spanned by the MCSM bases. Since numerical integration in angular-momentum projection is the most time-consuming part, we calculate on each mesh point parallelly in supercomputers such as the K computer.

We show calculated results of neutron-rich nuclei in the N ~ 40 region in \textit{pfgd_5} model space, which consists of the 0f_{7/2}, 1p_{3/2}, 0f_{5/2}, 1p_{1/2}, 0g_{9/2} and 1d_{5/2} single-particle orbits.