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Large-scale shell-model calculation of unnatural parity high-spin states in neutron-rich Cr and Fe isotopes[1] TOMOAKI TOGASHI, NORITAKA SHIMIZU, Center for Nuclear Study, University of Tokyo, YUTAKA UTSUNO, Advanced Science Research Center, Japan Atomic Energy Agency, TAKAHARU OTSUKA, University of Tokyo, MICHIO HONMA, University of Aizu —
We have investigated unnatural-parity high-spin states in neutron-rich Cr and Fe isotopes with large-scale shell-model calculation. This shell-model calculation has been carried out within the model space of the fp-shell + $0g_{9/2}$ +$1d_{5/2}$ orbits with the truncation of $1\hbar\omega$ excitation of a neutron. The effective Hamiltonian consists of GXPF1Br for the fp-shell orbits and $V_{\rm MU}$ with the modification for the other parts. This shell-model calculation has described and predicted the energy levels of both natural and unnatural parity states up to the high spin in Cr and Fe isotopes with $N \leq 35$. The total energy surfaces have presented the overall prolate deformation and indicated that the excitation into a $\nu 0g_{9/2}$ orbit plays the roles of inducing the prolate deformation for the unnatural parity states in these nuclei. It has been found that the excitation energy of $9/2^+_1$ dropping down with the increase of neutrons in neutron-rich odd-mass Cr and Fe isotopes is linked to the Fermi surface approaching the neutron shell orbits.

[1]MEXT SPIRE Field 5 "The origin of matter and the universe" and JICFuS

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