STRANGE NUCLEI: A NEW DIMENSION IN NUCLEAR PHYSICS

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The Continuous Electron Beam Accelerator Facility (CEBAF) at the Jefferson Lab (JLab) has enabled high precision spectroscopic investigation of Λ-hypernuclei which is useful for studying ΛN interactions. Spectroscopy of $^{10}_{\Lambda}$Be and $^{12}_{\Lambda}$B hypernuclei was carried out at JLab Hall C using the (e, e′ K^+) reaction. The binding energy of the ground-state of $^{10}_{\Lambda}$Be was found to be B_Λ = 8.55 ± 0.07(stat.) ± 0.11(sys.) MeV. The result indicates that the ground-state energy is shallower than that of an emulsion study by about 0.5 MeV which provides valuable experimental information on the charge symmetry breaking effect in the ΛN interaction. The Λ–binding energy (B_Λ) for the $^{12}_{\Lambda}$B was found to be 11.524 ± 0.019 MeV.

A simultaneous description of non-strange nuclei, hypernuclei and multiply- strange nuclear systems provided by a single mass formula is shown to be useful for estimating binding energies of nuclear systems over a wide mass range, including the light mass nuclei. It not only provides a good fit to the existing experimental data on hyperon-separation energies but also reproduces results of the relativistic mean field (RMF) calculations. It also suggests the existence of a range of bound pure-hyperonic systems without any neutrons and protons among which 6Λ, $9\Xi^0\Xi^0$, $10\Xi^-\Xi^-$, $1\Lambda7\Xi^0$, $1\Lambda8\Xi^-$, $1\Xi^09\Xi^-$, $1\Xi^-8\Xi^0$ and $2\Lambda+3\Xi^0+3\Xi^-$ represent the lightest species.