

Hyperon-nucleus systems in G-matrix approach

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In the theoretical modeling of YN and YY interactions, it is very important to take into account not only the YN scattering data but also the hypernuclear data. Y-nucleus potentials (central+LS+ \dots) are basic quantities to represent hypernuclear properties. Λ binding energies and excited spectra in Λ hypernuclei are decisively important to derive Λ -nucleus potentials. In Σ systems, however, Σ -nucleus bound states may not exist except ${}^4_{\Sigma}\text{He}$. Then, it will be necessary to extract Σ -nucleus potentials from experiments such as quasi-free Σ productions and Σ -nucleus scatterings.

Here, we derive Λ - and Σ -nucleus potentials with the G-matrix theory starting from the Nijmegen ESC models (ESC04 and ESC07). Our G-matrix method has been confirmed to be quite powerful to derive reasonable p-nucleus potentials from realistic NN interactions, which describe p-nucleus scattering observables reasonably. The Σ -nucleus potentials derived from ESC04 and ESC07 are very different from each other: Their real parts are attractive and repulsive, respectively. We investigate how these difference appear in Σ -nucleus scattering observables. Another feature of the obtained Σ -nucleus potentials is that the imaginary parts are very strong, which are originated mainly from ΣN re-scattering in medium. Such a mechanism has not been taken into account in the analyses of quasi-free Σ productions, which makes their conclusions ambiguous.

The S=-2 sectors are also investigated in the G-matrix approach. Here, we discuss on the $\Lambda\Lambda$ and ΞN interactions in comparison between ESC04 and ESC07.