K^+ Momentum Spectrum from (K^-, K^+) Reactions in the Intranuclear Cascade Model*

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Multi-strange systems have recently attracted much attention in nuclear, particle, and astrophysics, as they may yield information on the *generalized* nuclear interaction between octet baryons, may reveal the inter-*quark* forces through the study of "H" particle, and may be realized as strange matter in neutron stars. Among them, nuclear systems with S=-2 form the starting point of these studies.

Recently, it has become possible to measure double strangeness exchange reactions (K^-, K^+) on nuclear targets. For example, small angle (K^-, K^+) cross sections at $p_{K^-} = 1.65$ GeV/c were measured on several targets at KEK-PS [1]. The measured K^+ momentum spectrum shows a striking structure: in addition to quasifree peaks reflecting the elementary process $K^- p \to K^+ \Xi^-$, there appears a broad bump extending from $p_{K^+} = 0.35$ GeV/c to 1.0 GeV/c.

We have studied K^+ momentum spectra in (K^-, K^+) reactions and double-hyperfragment $(S = -2)$ formation by using a intranuclear cascade model calculation. We have found that this bump is well explained by taking account of direct reactions $p(K^-, K^+)\Xi^{(*)}$, heavy meson subthreshold production and decay [2], and various *two-step processes* (Fig. 1); in the first step, the strange quark in the K^- particle is transferred to other baryons, and $\bar{s}s$ pair creation occurs in the second step. These two-step processes are effective in producing K^+ mesons in this energy region for the following two reasons:

(a) The incident energy corresponds to baryon resonance region, where the cross section becomes maximum. (b) When the intermediate mesons are heavy $(\rho, \eta, \omega, ...)$, the second step reaction becomes exoergic $(Q > 0)$, then the strangenes production cross sections with these mesons are much larger than those with pions.

This two-step mechanism not only explains the K^+ spectra for various nuclear targets, but also suggests that more double-hyperfragments would be formed at this momentum region. More detailed study of double-hyperfragment formation in (K^-, K^+) reaction and Ξ^- absorption at rest, which is the other clean reaction to make double-hyperfragments, is in progress.

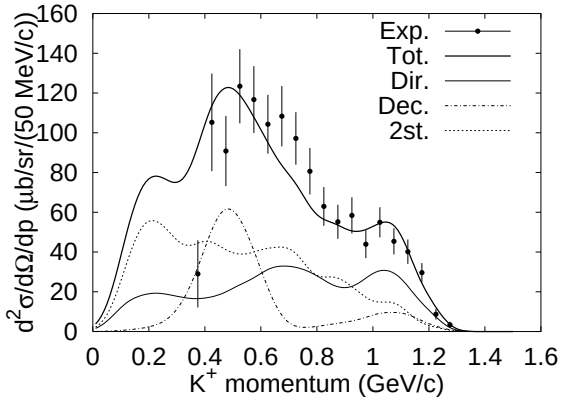

Figure 1: K^+ momentum spectrum from the ^{107}Ag(K^-, K^+) reaction. The thin solid, dot-dashed, and dotted lines show the contribution from direct processes, meson decays, and two-step processes, respectively. The thick solid line represents the calculated total spectrum. The experimental data are taken from [1].

[1] T. Iijima *et al.*, Nuc. Phys. **A546** (1992) 588.
[2] C. Gobbi, C. B. Dover and A. Gal, Phys. Rev. **C50** (1994) 1594.

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