RCNP EXPERIMENT E250

PROPOSAL FOR EXPERIMENT AT RCNP

06 July 2004

TITLE: **Continuing study of the structure and decay of s-hole states in light nuclei: Measurements of ^{5}He(s-hole) and ^{8}Li(s-hole) states**

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RUNNING TIME:	Installation time without beam	2 days
	Test running time for experiment	0.5 days
	Data runs	6.5 days
BEAM LINE:		Ring : WS course
BEAM REQUIREMENTS:	Type of particle	(polarized) p
	Beam energy	392 MeV
	Beam intensity	$\geq$ 50 nA
	Other requirements	energy resolution $\leq$ 200 keV (halo-free, small emittance)
BUDGET:	Experimental expenses	1,600,000 yen
	Travel plans - 15 participants should be supported by RCNP	

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SUMMARY OF THE PROPOSAL

The purpose of the proposed experiment is to aim at systematic investigations on the fragmentations of s-hole states in light nuclei. In the previous E110/E148/E204 experiments, we measured the particle decay of the s-hole states in ^{11}B, ^{15}N and ^{6}He, and triton-decay probabilities were found to be large compared to α-decay for all s-hole states despite their smaller Q-values than those of α-decay. As for the ^{11}B and ^{15}N, this supports the selection rule for fragmentations of doorway s-hole states in light nuclei predicted by the microscopic SU(3)-model calculations. In the case of ^{6}He, however, neither the SU(3)-model nor the shell-model calculation predicts the enhancement of triton-decay, mainly due to the large difference of the Q-value between t-decay and α-decay, while the experimental branching ratio of t+t decay from the ^{6}He(s-hole) state has been obtained as about 70 %. If the ground state of ^{7}Li is well described by the t+α cluster structure and the s-hole state in ^{6}He is considered to correspond to the one-nucleon knockout state from an α-cluster in ^{7}Li, the experimental dominance of t+t decay can naturally be understood.

Since the ground states of ^{6}Li and ^{9}Be are known to have large cluster-structure components of α+d and α+α+n, respectively, it is interesting to continue our measurements for the ^{6}Li and ^{9}Be targets. We propose to study the structures and fragmentations of the s-hole states in ^{5}He and ^{8}Li via the quasifree ^{6}Li$(p,2p)$ and ^{9}Be$(p,2p)$ reactions at 392 MeV incident energy. Charged particles decaying from the hole states are measured in coincidence with two emerging protons of the $(p,2p)$ reaction. The recoil momentum dependence of the cross sections of the p- and s-hole states in ^{5}He and ^{8}Li will also be measured in order to investigate the reaction mechanism and to estimate the non-quasifree background around the excitation energy region of the s-hole states.