

RIBF ULIC Symposium/mini-WS Report

* English only

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Title	[RIBF-ULIC-miniWS:026] Experimental observation and theoretical analysis for a new cluster law beyond the Ikeda diagram
Date	March 5-6, 2013
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HP address	http://indico2.riken.jp/indico/conferenceDisplay.py?confId=1058
Contact Person(s) (Name, Affiliation)	Makoto Ito (Kansai Univ.), Yoshiko En'yo (Kyoto Univ.), Hidetoshi Yamaguchi (CNS) and Hideaki Otsu (RNC)

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	Makoto Ito:	31,520	JPY
	Masatoshi Ito:	23,360	JPY
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Summary of discussions and its (expected) results:

The current and future experimental and theoretical studies were presented. We discussed possibilities of new cluster rules beyond Ikeda diagram.

Many experimental studies were reviewed by experimentalists. They showed validities of inelastic scattering in RCNP/CYRIC and resonance scattering in CRIB to study cluster structures. Theorists pointed out that inelastic scattering was effective only in nuclei containing the cluster structure in the ground state. Decay measurements are also valid to study cluster states above threshold energy. On the other hand, indirect methods such as the beta decay to populate the cluster state may not be suitable due to small overlap with the wave function of the cluster state.

SAMURAI experiment on ^{16}C at RIBF will be performed in order to find the new paradigm of cluster rules in neutron far rich nuclei. CRIB is ready to study the non-alpha cluster structure by the non-alpha nucleus transfer reaction such as ($^{14}\text{N},d$), ($^{20}\text{Ne},\alpha$), and ($^{15}\text{N},p$) reactions, etc. Experimental studies of the alpha gas-like structure in ^{12}C , ^{16}O , and ^{20}Ne will extend the Ikeda diagram to the direction of excitation energy.

In the theoretical side, many possibilities on "beyond the Ikeda diagram" were proposed.

- New type of the classification of cluster structure
- The rule of the appearance of molecular orbital /gas-like structures
- The energy rule of medium heavy clusters

In order to investigate the cluster structure intuitively and effectively, it is important to construct the macroscopic model for the excitation going to cluster states like as collective models developed for the nuclear deformation.

In discussions, we confirmed the medium-heavy cluster transfer reaction could become a powerful tool to study the cluster structure. Role of neutrons to form the alpha cluster state was also discussed. It becomes difficult to observe the alpha cluster state in neutron-rich nuclei due to the level density. In heavy nuclei, where the alpha clusters may be dissociated by the LS force, the mechanism of the cluster formation and cluster excitation should be clarified.

We will hold the next workshop autumn in 2013. Details will be determined in the JPS meeting March 2013.

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