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Formation of Cluster Complexes by Cluster-Cluster-Collisions

MASAHIKO ICHIHASHI, Toyota Technological Institute, HIDEHO ODAKA, Genesis Research Institute, Inc. — Multi-element clusters are interested in their chemical and physical properties, and it is expected that they are utilized as catalysts, for example. Their properties critically depend on the size, composition and atomic ordering, and it should be important to adjust the above parameters for their functionality. One of the ways to form a multi-element cluster is to employ a low-energy collision between clusters. Here, we show characteristic results obtained in the collision between a neutral Ar cluster and a size-selected Co cluster ion. Low-energy collision experiment was accomplished by using a newly developed merging-beam apparatus. Cobalt cluster ions were produced by laser ablation, and mass-selected. On the other hand, argon clusters were prepared by the supersonic expansion of Ar gas. Both cluster beams were merged together in an ion guide, and ionic cluster complexes were mass-analyzed. In the collision of Co_2^+ and Ar_N , Co_2Ar_n^+ ($n = 1 - 30$) were observed, and the total intensity of Co_2Ar_n^+ ($n \geq 1$) is inversely proportional to the relative velocity between Co_2^+ and Ar_N . This suggests that the charge-induced dipole interaction between Co_2^+ and a neutral Ar cluster is dominant in the formation of the cluster complex, Co_2^+Ar_n .

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