3 - 1 Probing the Geometry of Ar_2N_2 Cluster by Heavy Ions Impact*

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The molecular complexes play an important role in planet's atmosphere and chemical reactions of astrophysics. The investigation of geometry configurations for molecular complexes is an important subject both in experimental and theoretical aspects. As a prototype molecular system, the investigation of geometry configuration of van der Waals cluster Ar_2N_2 attracts considerable attention recently. The different equilibrium configurations of Ar_2N_2 cluster were reported by experiments as linear conformation[1,2] and theoretical calculations as linear or spatial X-shaped conformations[3−6].

In the present work, we report the investigation of Ar_2N_2 geometry for the first time by collision with Ne^{8+} ions at an impact energy of 1 MeV based on the reaction microscopes in Lanzhou[7]. The momentum vectors of three correlated singly charged fragments $Ar^+/Ar^+/N_2^+$ from three-body coulomb explosion are measured in coincidence. Considering N_2 as a whole, the triangular geometry is directly identified. Combined the classical dynamics numerical simulation[8], the initial bone length and bond angle were determined. Fig. 1 shows the measured momentum correlation angles (MCA) and calculated relationship of MCA23 and initial bond angle.

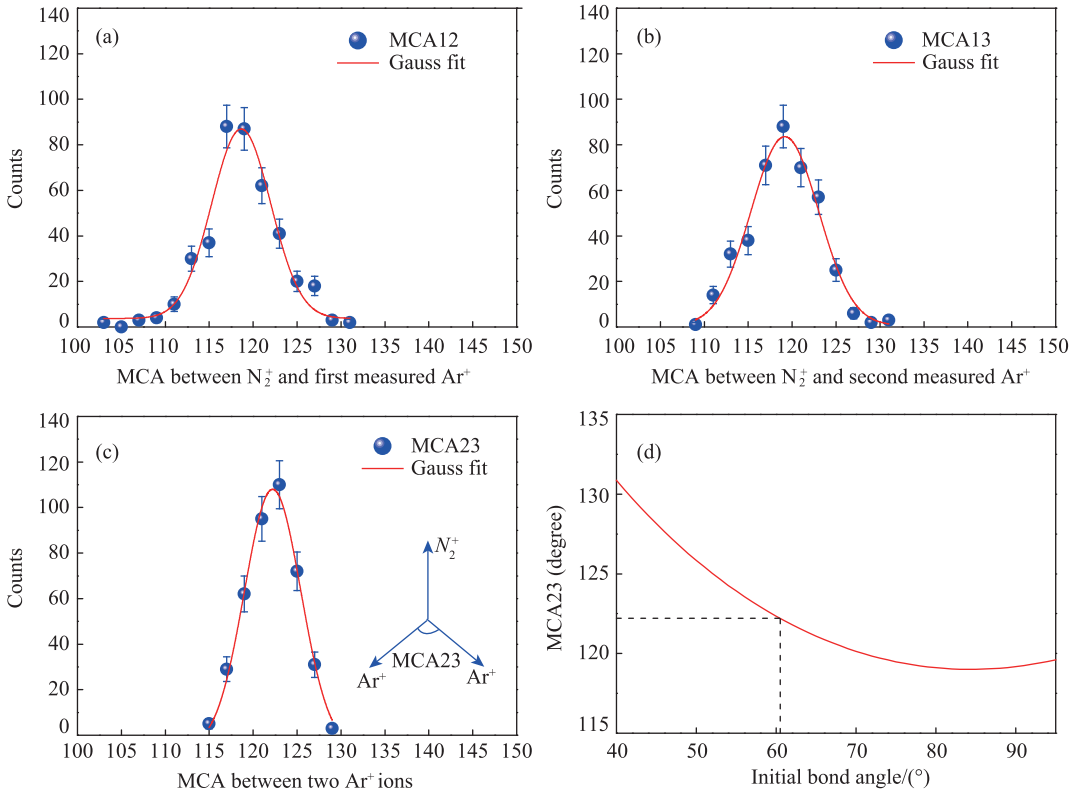

Fig. 1 (color online) The distributions of measured momentum correlation angle (MCA) between (a) N_2^+ and first measured Ar^+; (b) N_2^+ and second measured Ar^+; (c) two Ar^+ ions; (d) The simulation results of initial bond angle vs momentum correlation angle (MCA23).

Our results confirm the nonlinear structure of Ar_2N_2 and agree well with the spatial X-shaped conformation of theoretical calculation. In order to get more detailed configuration of Ar_2N_2 cluster, a four-body fragmentation experiment is expected and under plan.

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