

# Fragmentation dynamics of N<sub>2</sub>Ar dimer induced by highly charged ions

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Molecular dimers widely exist in planetary atmosphere, and play an important role in molecular and surface physics, astrophysics, and climate. The N<sub>2</sub>Ar dimer is a typical molecular complex of Ar with N<sub>2</sub>, which is particularly relevant to the atmosphere of Titan.

In the present work, the 1 MeV Ne<sup>{8+}</sup> ions were used to produce the (N<sub>2</sub>Ar)<sup>{3+}</sup> ions, the momenta of fragment ions of three-body fragmentation of N<sub>2</sub>Ar were measured based on the reaction microscopy. Our results indicate that (N<sub>2</sub>Ar)<sup>{3+}</sup> ion can decay from nonsequential dissociation or sequential dissociation. These three mechanisms can be directly distinguished in Dalitz plot and Newton diagrams. In the sequential dissociation processes after single electron loss of Ar site and double electron loss on N<sub>2</sub> site, the dimer ion starts to dissociate along the potential energy curve of N<sub>2</sub><sup>{2+}</sup> + Ar<sup>+</sup>, the metastable N<sub>2</sub><sup>{2+}</sup> rotates when it is far away from Ar<sup>+</sup> and finally fragment into two N<sup>+</sup> ions, the two fine structure appear in Newton diagram. The ring structure indicates the dissociation from the metastable N<sub>2</sub><sup>{2+}</sup> ions of longer lifetime and the fusiform structure is from the dissociation from the metastable N<sub>2</sub><sup>{2+}</sup> ions of shorter lifetime.

**Primary authors:** YAN, Shuncheng (Institute of Modern Physics, Chinese Academy of Sciences); FENG, Wentian (Institute of Modern Physics, Chinese Academy of Sciences); ZHU, Xiaolong (Institute of Modern Physics, Chinese Academy of Sciences); MA, Xinwen (Institute of Modern Physics, Chinese Academy of Sciences)

**Co-authors:** Mr HAI, Bang (Institute of Modern Physics, Chinese Academy of Sciences); Dr GUO, Dalong (Institute of Modern Physics, Chinese Academy of Sciences); Dr QIAN, Dongbin (Institute of Modern Physics, Chinese Academy of Sciences); Mrs ZHAO, Dongmei (Institute of Modern Physics, Chinese Academy of Sciences); Mr WANG, Hanbing (Institute of Modern Physics, Chinese Academy of Sciences); Mr ZHANG, Ming (Institute of Modern Physics, Chinese Academy of Sciences); Mr ZHAO, Qiushuang (Lanzhou University); Dr ZHANG, Ruitian (Institute of Modern Physics, Chinese Academy of Sciences); Dr ZHANG, Shaofeng (Max-Planck Institute for Nuclear Physics); Dr XU, Shenyue (Institute of Modern Physics, Chinese Academy of Sciences); Mr GAO, YONG (IMPCAS); Dr HUANG, Zhongkui (Institute of Modern Physics, Chinese Academy of Sciences)

**Presenters:** ZHU, Xiaolong (Institute of Modern Physics, Chinese Academy of Sciences); MA, Xinwen (Institute of Modern Physics, Chinese Academy of Sciences)

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