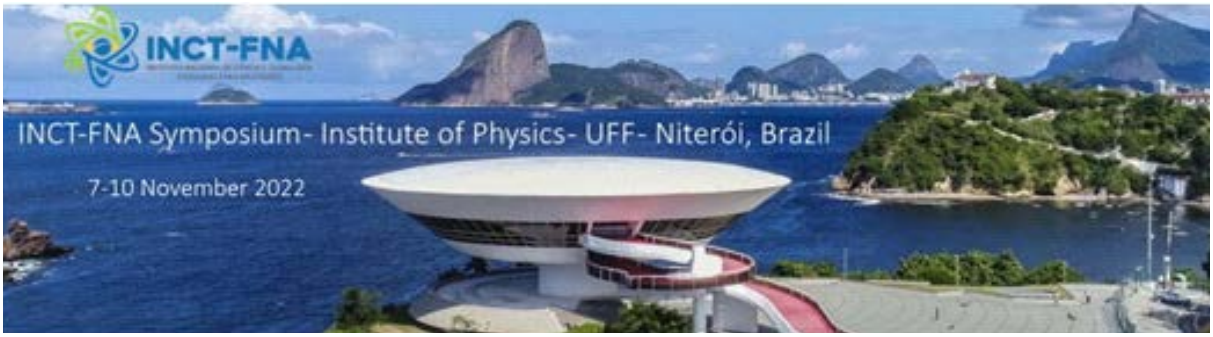

Strong isotopic selectivity on dication formation of benzene

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Double ionization of benzene initiates a competition between its fragmentation driven by Coulomb repulsion anddication stabilization, in which the molecule undergoes a strong geometric rearrangement. The removal of two electronsin intermediate-sized molecules causes an enormous disturbance in molecular bonding, such that, in most cases, thebonds are not sustained and the molecule breaks up. There is, however, the possibility of a reorganization of thechemical bonds forming a metastable dication. In order to study the dication production of benzene – an evensymmetrical molecule – the DETOF (Delayed Extraction Time-Of-Flight mass spectrometry) technique was employed.We find experimentally that stabilization following an electron-impact-induced double-ionization is remarkably sensitive tothe isotopic replacement of just one ^{13}C atom in the benzene ring. This result has no analog in the dication production ofsmaller molecules, and should not depend on the nature of the ionizing radiation that triggers it. The large reactivity ofmedium-size hydrocarbon dications points towards an alternative route to imprint isotopic signatures in astrophysicalprocesses.

References

Sigaud, Lucas; Wolff, Wania& Montenegro, Eduardo C. “Strong isotopic selectivity on dication formation of benzene”Physical Review A 105 (2022): 032816. DOI: 10.1103/PhysRevA.105.032816