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Accurate gas phase ion chemistry for reliable complex models

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Ionic processes in the gas phase have a fundamental and applicative relevance in several fields of chemistry and physics, e.g. astrochemistry and atmospheric science(1), biophysics(2), activation and/or functionalization of simple starting materials(3). The interest spans from the study of the photofragmentation of ions and charged clusters to the formation of charged species, molecules and radicals via chemical reactions. Thus, much effort has been devoted to study ion-molecule reactions in the gas phase, considered as a model laboratory for the chemistry of terrestrial and planetary atmosphere, and for the molecular synthesis in the interstellar space(4). These reactions may play a role in the chemical networks taken into account by the complex non-linear models of both atmospheric climate and the ISM evolution. Despite the fundamental role of neutrals species in several process, the formation of neutral species from ion-molecule reactions is also important, because these reactions may represent more efficient route to neutrals than neutral-neutral reactions, either destroying or producing neutrals by faster reactions.

In the presentation a brief overview of the atmospheric challenges, the role of laboratories studies and the importance of ions in atmospheric processes will be highlighted. As example, the results on SO₂⁺ chemistry(5), obtained at the synchrotron radiation facility ELETTRA, will be briefly presented and discussed. The experimental limits of these types of studies and the future perspectives based on FEL facility will be introduced.

References

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