

Ammonium Salts as a Source of Small Organic Molecules Observed with DFMS/ROSINA

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Abstract

Quirico et al. (2016) showed that the dip at 3.2 μm in the infrared spectrum measured by the VIRTIS instrument on the surface of comet 67P/Churyumov-Gerasimenko is compatible with R-COOH and/or the ammonium ion NH_4^+ [1]. If there was ammonium formate on 67P, is the ROSINA mass spectrometer suite [2] on ESA's Rosetta spacecraft capable to detect it by its sublimation products in the chemically complex cometary coma [3]? To answer this question, laboratory reference data is a necessary fundament on which the interpretation of space data can be based. Thus, we investigated two prototypic ammonium salts, namely ammonium chloride and ammonium formate, with the laboratory twin model of the Double Focusing Mass Spectrometer DFMS, in order to generate such reference high-resolution EI mass spectra. For both sublimating salts, we observed small organic molecules besides the main decomposition products (ammonia and the respective acid) which could be used as tracer molecules.

We compare our experimental findings with available theoretical and experimental literature, as well as with in situ data collected during a dust event on September 5, 2016, at comet 67P and we hope to thereby contribute to the debate whether ammonium salts are an extended source of ammonia and hence an abundant species in comets.

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References

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