

Origin of molecular oxygen in comets

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The ROSINA mass spectrometer onboard the Rosetta spacecraft enabled the detection of O₂ in the coma of comet 67P/ChuryumovGerasimenko (67P/CG) with local abundances in the 110% range and a mean value of 3.80% (Bieler et al. 2015). A recent examination of the mass spectra taken by the Giotto spacecraft during its flyby of comet 1P/Halley indicated that a production rate of O₂ of 3.7% with respect to water is found compatible with the Halley data, suggesting that this molecule is ubiquitous in comets (Rubin et al. 2015). Here we discuss the key observations performed by the Rosetta spacecraft that allow deriving important constraints on the origin of molecular oxygen in comets. Based on these constraints, we present the different mechanisms that can explain the presence of this molecule in comets. We conclude with some hints on i) the formation conditions of comets and ii) the nature of their accreted materials that are consistent with the observations.
