Abstract

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Nicolas Fray, Anais Bardyn, Hervé Cottin, Donia Baklouti, Christelle Briois, Cécile Engrand, Henning Fischer, Klaus Hornung, Robin Isnard, Yves Langevin, Harry Lehto, Lena Le Roy, Eva Maria Mellado, Sihane Merouane, Paola Modica, Francois Régis Orthous-Daunay, John Paquette, Jouni Rynö, Rita Schulz, Johan Silén, Sandra Siljeström, Oliver Stenzel, Laurent Thirkell, Kurt Varmuza, Boris Zaprudin, Jochen Kissel, Martin Hilchenbach:

Nitrogen-to-carbon atomic ratio measured by COSIMA in the particles of comet 67P/Churyumov–Gerasimenko

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The COmetary Secondary Ion Mass Analyzer (COSIMA) on board the *Rosetta* mission has analysed numerous cometary dust particles collected at very low velocities (a few m s−1) in the environment of comet 67P/Churyumov–Gerasimenko (hereafter 67P). In these particles, carbon and nitrogen are expected mainly to be part of the organic matter.

We have measured the nitrogen-to-carbon (N/C) atomic ratio of 27 cometary particles. It ranges from 0.018 to 0.06 with an averaged value of 0.035 ± 0.011. This is compatible with the measurements of the particles of comet 1P/Halley and is in the lower range of the values measured in comet 81P/Wild 2 particles brought back to Earth by the *Stardust* mission. Moreover, the averaged value found in 67P particles is also similar to the one found in the insoluble organic matter extracted from CM, CI and CR carbonaceous chondrites and to the bulk values measured in most interplanetary dust particles and micrometeorites.

The close agreement of the N/C atomic ratio in all these objects indicates that their organic matters share some similarities and could have a similar chemical origin. Furthermore, compared to the abundances of all the detected elements in the particles of 67P and to the elemental solar abundances, the nitrogen is depleted in the particles and the nucleus of 67P as was previously inferred also for comet 1P/Halley. This nitrogen depletion could constrain the formation scenarios of cometary nuclei.