

The Isotopic Composition of Cometary Dust Measured With COSIMA On Board Rosetta

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The isotopic composition of a substance can provide important information about the substance's history, since isotopic fractionation is sensitive to many conditions such as chemistry, temperature, and radiation. The isotopic ratios of elements have been measured in many extraterrestrial materials, such as chondritic meteorites, interplanetary dust particles, and comets. The great majority of such cometary measurements have been in the gas phase, with relatively few measurements in the dust. Here we present measurements of isotopic composition for several elements measured in cometary dust using the COSIMA instrument.

COSIMA was a Time of Flight – Secondary Ion Mass Spectrometry (ToF-SIMS) instrument aboard the Rosetta orbiter that spent approximately 2 years within tens to hundreds of kilometers of the nucleus of comet 67P/Churyumov-Gerasimenko. COSIMA collected 35000 dust particles and fragments from 67P. Practical considerations restricted the number of particles upon which ToF-SIMS analysis was performed to a few hundred, and a subset of these particles will be discussed here. Comparison to measurements of the isotopic composition of other extraterrestrial matter will be made and the implications for the history of comets will be considered.