

COSIMA: A High Resolution Time-of-Flight Secondary Ion Mass Spectrometer for Cometary Dust Particles on Its Way to Comet 67P/Churyumov-Gerasimenkov

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The **CO**metary **S**econdary **I**on **M**ass **A**nalyser (COSIMA) is a high-resolution time-of-flight (TOF) mass spectrometer system on board ESA's ROSETTA spacecraft flying to comet 67P/Churyumov-Gerasimenkov. COSIMA will collect cometary dust particles on metal black targets which are exposed to space. After target exposure dust particles with sizes $10\ \mu\text{m}$ and bigger are identified on the target with an optical camera. An Indium ion beam is shot onto the particle surface and material from the particle is sputtered and ionised. The secondary ions are accelerated in an electric field and from the mass- and charge-dependent flight times of the ions a time-of-flight secondary ion mass spectrum (TOF-SIMS) is measured with a mass resolution of $m/\Delta m \approx 2000$ at $m = 100$. During commissioning in 2004 the COSIMA flight instrument performed according to specification. The first TOF-SIMS spectra in space in positive and negative ion modes were obtained from one of the instrument targets. COSIMA is now ready for the comet. The goal of the COSIMA investigation is the in-situ characterisation of the elemental, molecular, mineralogic and isotopic composition of dust particles in the coma of comet Churyumov-Gerasimenkov. Comets are remainders from the formation of the solar system and, therefore, analysis of cometary material can give important insights into the conditions of the first stages of planetary system formation and cometary evolution.