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The Alpha Particle X-Ray Spectrometer APXS on the Rosetta lander Philae to explore the surface of comet 67P/Churyumov-Gerasimenko

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Introduction
The Rosetta Mission was launched in 2004 with the main objectives to gain a better understanding of the origin and formation of comets and the solar system. After 10 years of cruise Rosetta rendevouded with the comet 67P/Churyumov-Gerasimenko in 2014 to study the nucleus of the comet and its environment. Rosetta consists of an orbiter and a lander (Philae) with 11 and 9 scientific experiments respectively. It did what has never been attempted before, orbiting and landing on a comet. After orbit insertion in August 2014, the main spacecraft will follow the comet for several months to investigate its surface. Subsequently, Philae has been deployed for a safe landing. As part of the lander payload the APXS will measure in situ the chemical composition of the comet's surface and it's changes during the journey of the comet around the sun. The data obtained with the APXS will be used to characterize the surface of the comet, to determine the chemical composition of the dust component, and to compare the dust with known meteorite types.
APXS combines an alpha mode for alpha backscattering spectroscopy and an x-ray mode for alpha particle/x-ray induced x-ray spectroscopy (XRF) in one single instrument, being low in mass (640g) and power consumption (1.5 W in operating mode) [4]. The comet surface will be irradiated by a Curium 244 source exciting characteristic x-rays of the elements present in the surface material. The alpha mode will allow detection of elements like C and O and groups of elements with a higher Z. The x-ray-SD-detector will allow the detection of most of the elements from Na up to Ni and above. The design of the Rosetta APX spectrometer is based on the experience gained with the APXS built for Russian and American Mars missions: Mars 96 spacecraft and Mars Pathfinder, MPF [1]. Two APXS were also built for the Mars Exploration Rovers mission of the NASA, MER [2-3].
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