Gas chromatography for space exploration : application to the in situ analysis of Titan's atmosphere, comets nucleus and martian soil

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Gas chromatography is one of the most powerful technique for the in situ chemical investigation of extraterrestrial environments. Its successful use in past planetary missions to Mars (1976-78) and Venus (1978-85) made it the main method selected for the *in situ* molecular characterization of the Titan's atmosphere, comets and the Martian soil. Indeed gas chromatography fully meet the severe constraints required in space instrumentation such as small weight and size, low power consumption, high mechanical strength and resistance to deep space conditions (vacuum, cosmic rays,...).

This paper presents the gas chromatographic subsystems which have been developed at LISA and SA, respectively for the Huygens probe of the Cassini-Huygens mission to Titan [1], the Philae probe of the Rosetta mission to a comet [2] and the future landing probe of the MSL 2009 mission to Mars [3]. The coupling of these GC subsystems with pyrolysis and chemical derivatization techniques allows the chemical analysis of a wide range of molecules, including non-volatiles complex organics such as aminoacides and nucleobases, the search of wich is of particular interest for exobiology. The analytical capabilities of these subsystems, with a particular emphasis of their exobiological aspects and implications, are described.

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[2] C. Szopa, , R. Sternberg , F. Raulin and H. Rosenbauer, PSS, 863-877, 2003

[3] Cabane, M., P. Coll, C. Szopa, G. Israël, F. Raulin, R. Sternberg *et al*., *Adv. Space Research*, , 33, 2240-2245, 2004