Paper ID: 70249
student

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IPB)

Author: Ms. Harshini K Balaji
India, harshini.k.balaji@gmail.com

Ms. Nithyaashree Giridharan
R V College of Engineering, Bengaluru, India, nithyaashreegiri@gmail.com

RUBITICS: THE SMARTER GCMS FOR MARS

Abstract

A GCMS stands for a Gas Chromatograph and Mass Spectrometer. These two instruments are used to identify compounds from both soil and atmospheric samples. The GCMS usually has a mass of around 40 kilograms and is the size of a microwave oven, but what if we could downsize it? Downsizing the GCMS means that the number of equipment and instruments that can be used and carried by a rover can drastically increase. Rubitics is essentially a GCMS, only smaller and more efficient.

This paper discusses the way Rubitics functions and how a GCMS can be remodelled and used to its fullest potential. The column of the Gas Chromatograph is replaced with composite materials to increase the flexibility of the tube, thereby increasing the number of columns along with finger-like projections on the interiors, which will aid in a much more precise separation of compounds. The inert carrier gas container is changed with a more durable, strong composite that will be instrumental in reducing the mass of the cylinder, and a safer chemically unreactive material will ensure complete pure storage. Rubitics will also contain a cooling system so as to be more power-efficient and aid in obtaining precise results. The material of the oven used in the gas chromatograph will be of much more insulating capacity (thermal resistance), lighter in mass, and smaller in size. Rubitics maintains the optimum shape to provide the most temperature and energy-efficient GCMS ever. Rubitics houses a compact electronic bay with sensors and a microprocessor for analysing the different components. The detectors' values are processed in the onboard microprocessor with the help of TinyML. This light algorithm can help in reducing the bandwidth consumed in transmitting unnecessary data to the ground station through providing in-situ data filtration. The paper also contemplates using such an algorithm to improve the efficiency of GCMS.

In conclusion, Rubitics will be the future of GCMS technologies and sample analysis on different planetary terrains. Due to its re-engineered structure, it occupies lesser weight, size, and space. Rubitics thereby changes the number and quality of experiments that can be performed on Mars, leading to better insights for successful future habitation.