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LAB ON CHIP ABSORPTION PHOTOMETER (LCAP) FOR SOLAR SYSTEM EXPLORATION:
DESIGN, ANALYSIS AND TECHNICAL CHALLENGES

Abstract

Understanding the transport of hydrogen and deuterium in the solar system are key components to unveiling the mystery behind the transport of water in planetary atmospheres of the Solar System. The isotopic ratio of deuterium to hydrogen (D/H) has been used as a standard to compare the presence of water, its escape and planetary inventory. Lyman Alpha transitions of hydrogen and deuterium are used as tracers for measuring the D/H ratio. Hydrogen and deuterium absorption cell photometer instruments have been designed for retrieving D/H ratios and have a flight heritage from Cassini, Nozomi and Mars Orbiter Mission (MOM). In the present study, we present a Lyman Alpha absorption cell photometer using Lab on Chip (LoC) technology in an attempt to work towards miniaturization of the device. LoC components have been previously studied for space instruments and are widely used in the field of biotechnology and microfluidics. We highlight the benefits of using the technology, technical challenges in the miniaturization of the instrument and feasibility of production. Analytical and computational techniques are employed to study performance characteristics of the instrument. Further, applications of the instrument are discussed in light of satellite networks and future mission opportunities.