Space Resources (10)
Space Resources (2) (2)

Author: Dr. Sergey Kazakov
Ioffe Physico-Technical Institute, Russian Federation

Mr. Mikhail Grevtsev
Ioffe Physico-Technical Institute, Russian Federation
Prof. Victor Chistyakov
Ioffe Physico-Technical Institute, Russian Federation
Dr. Sergey Solov'ev
Ioffe Physico-Technical Institute, Russian Federation

THE USE OF RADIATION-RESISTANT MATERIALS IN GAS SEMICONDUCTOR FOURIER SPECTROSCOPY FOR EXPRESS ANALYSIS OF ROCKET FUEL IN THE PRODUCTION PROCESS ON THE MOON / MARS / ASTEROIDS

Abstract

Over the past 30 years, the development of semiconductor sensors of oxygen concentrations [Kazakov S A, Kaminskii V V. RF patent No. 2 546 849 (April 10, 2015); Kazakov S A, Kaminskii V V, Solov'ev S M and Sharenkova N V. Scientific Instrumentation 25 116-123 2015], hydrogen [Vasil'ev A A, Sokolov A V, Samotaev N N. RF patent No. 2 371 709 (October 27, 2009)] and volatile hydrocarbons for space research, including for testing rocket and space technology products on a bench base [Gutman E Y, Myasnikov I A, Kazakov S A, Rugentsev S V, Dymenko S K. Sensors and Actuators B-Chemical, 14 687-689 1993], for detecting leaks, remains relevant hydrogen when testing cryogenic engines [Pijolata C, Tourniera G, Breuila P, Matarinb D, Nivetb P. Sensors and Actuators B-Chemical, 82 166-175 2002]. Currently, the requirements for radiation resistance of materials used for the space industry, not only structural but also functional, in particular, materials for determining gas concentrations, have increased. These requirements are met by rare-earth semiconductor materials based on SmS. Their high radiation resistance is due to both the specific electronic structure of the material (the presence of 4f-electrons that determine the electrical properties of the semiconductor) and the signs characteristic of radiationresistant materials as a whole (thermal stability, a high number of stoichiometric vacancies, and a high concentration of conduction electrons) [Kaminsky V V, Vasilyev L N, Gornushkina E D, Solovyev S M, Sosova G A, Volodin N M. 29 306-308 1995]. The relevance of sensory topics, and in particular, the selected direction, is also due to the fact that at present, using optical analogy, it has been possible to construct semiconductor Fourier spectroscopy as applied to gas analysis systems [Kazakov S A, Grevtsev M A, Havrov G D. Journal of Physics: Conference Series 1135 (2018) 012107; Kazakov S A, Grevtsev M A, Khavrov G D, Solov'ev S M, Sharenkova N V, Kazanin M M, Kaminskii V V. Journal of Physics: Conference Series 1400 (2019) 077058]. The work was supervised by Academician Prof. Lev Zelenyi (IKI, Moscow).