SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies and Concepts (3)

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THERMOMAGNETIC SPACE ENERGY SYSTEM CONCEPT

Abstract

Creating Space Station (CS) depends on its energy system, which significantly affects the total weight, reliability, control and cost of the station. Problem of creating a space power supply systems is discussed in many papers, where various sources and generators of electrical energy are consider. Development of the industrial uptake of outer space for peaceful purposes provides for comprehensive fundamental research. In order to improve application of satellite systems in the national economy innovative space technology should be further developed. Increasingly popular in the development of environmentally friendly energy conversion technologies are becoming energy devices based on thermomagnetic phenomena. Historically, these phenomena have been found in 1881 when E. Warburg experimentally observed iron self heating in a magnetic field. Currently, thermomagnetic phenomena is a changing of magnets thermal state (internal energy, temperature) because of their magnetic state shift, including the magnetocaloric effect (MCE), the energy loss in the magnetic hysteresis and changing of their thermal characteristics. After the experiments made by E. Warburg (1881) scientists, such as Tesla (1889) and T.Edison (1888), tried to use this effect for practical purposes. However, there was no sufficient data base for magnetic materials, so they were unable to successfully implement their ideas. Further the development of research in the field of magnetic materials and their properties, the discovery of a number of MCE materials, creating technologies for producing high-coercivity permanent magnets researchers returned to the use of these effects in engineering. Currently, in the developed countries, studies in the application of thermomagnetic technology (TMT) for creating engines, generators, chillers are in progress [BjØrk R., 2010; Roudant J., 2010; Kitanovski A., 2012; Bouchekara HREH, 2012; Trapanese M.,2012. and others]. Comparative analysis of existing methods of energy conversion shows that usage of thermomagnetic engines (TME) has the practical ability for low-grade thermal energy utilization. TME in compare with photocells and thermoelectric transducers has higher output of density power. Creating significant power at low grade temperature fluctuations TME can be used in those conditions where other known energy conversion technologies do not provide a sizeable output. A further development of TMT could be applied for space energy supply systems design.