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LOW ENERGY NUCLEAR REACTIONS - A BONANZA FOR SPACE EXPLORATION?

Abstract

Scientists worldwide have been quietly investigating low-energy nuclear reactions (LENR) for the past 20 years. Researchers in this controversial field are now claiming paradigm-shifting results, including generation of large amounts of excess heat, nuclear activity and transmutation of elements. (DIA-08-0911-003). In fact, exothermic processes that were thought to be a result of nuclear reaction have been observed since the 1920s. Most of the recent work has been in university laboratories focused on the Solid State Physics associated with the weak-force nuclear reactions that are the heart of LENR. One example of recent LENR work with a focus on applications is being conducted by an Italian inventor named Andrea Rossi of the University of Bologna and his scientific consultant, physicist and emeritus professor Sergio Focardi. They have demonstrated a device called the E-Cat or Energy Catalyzer which, according to a 2008 patent application, involves "a method and apparatus for carrying out nickel and hydrogen exothermal reactions," with the production of copper from a nickel source as a result. More recently, Prof George Miley at the University of Illinois at Urbana has demonstrated 200 watts of continuous power in a well-controlled laboratory experiment. Most of the researchers are referring to their work as Low Energy Nuclear Reactions, LENR, because the term more accurately describes the relevant physics and it avoids the stigma associated with Cold Fusion. Several theories have been proposed that support a nuclear process. One of the notable theories is the Widom-Larsen theory. It provides a rationale for the process whereby an ultra low-energy neutron or a proton can enter the nucleus of a metal host.

Presently, space experiment must rely on solar power or expensive Radioisotope Thermoelectric Generators for electrical power. While the US has operated one reactor in space and the Russians have operated 39, the barriers to entry for reactors appear very high. LENR may provide a very scalable power system. Because some of the reactions release very modest amounts of radioactivity which is easily shielded, the massive shields associated with space reactors may not be required. Yet evidence suggests that the Nickel-Hydrogen reactions may scale to large sizes (¿ 1MW), so they could have the advantages of an RTG and a reactor. This paper investigates the claims and on-going efforts at a variety of locations and examines the impact LENR reactors might have for low-cost space exploration based on data generated to date.