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Assessment of diamagnetic antimatter storage for fueling the deep space relativistic rockets

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Common energy sources (chemical, nuclear, thermonuclear) currently in use or proposed for fueling a spacecraft have one feature in common: only a small fraction of their total mass-energy is extracted, and the leftover is a waste. As a result, none is capable of accelerating deep-space rockets to relativistic speed so that even the nearest stars stay beyond the range of reach for a reasonable time-of-flight. The only hope is matter-antimatter annihilation which can be used in two ways: propulsion by annihilation products and propulsion by relativistic ions from the accelerators powered by annihilation reactor. The use of annihilation energy for propulsion requires antimatter storage onboard, and a large amount of it in liquid or solid state to ensure its highest energy density. The prospects of diamagnetic antihydrogen storage in a container with a thin magnetic barrier near its internal wall are discussed in this report. The non-potential energy barriers, in which magnetic field diminishes with the distance from the wall, can be created by arrays of current-carrying loops with alternate direction of current. Various arrays are modelled to produce containers of different geometries. The level of stored antihydrogen as a function of rocket acceleration and magnetic field strength is estimated. The problem of hazardous antihydrogen vapors is discussed.

Biography

Oleg G Semyonov has completed his PhD in 1980 from Lebedev Institute of Physics, Moscow. He held the position of Principal Investigator of SUNY at Stony Brook, USA until 2013 and currently is the Research Professor (retired) at this university. He has published more than 50 papers in reputed journals and a book named *Road to the stars: Relativistic rocket.*

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