EDITORIAL

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A new interdisciplinary forum for the growing field of plasma-based space propulsion

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Plasma propulsion utilizes the electric energy to, first, ionize the propellant and, then, deliver energy to the resulting plasma leading to plasma acceleration. Using electrical energy for acceleration of the ionized propellant, electric propulsion systems combine high specific impulse and high efficiency at low thrust. From this point of view, electric propulsion compares favorably to solid and liquid propellant rockets, which are characterized by a low specific impulse. The field of plasma propulsion includes a broad variety of thrusters that can achieve high propellant exhaust velocity, thereby offering a large mass savings for space vehicles as compared to chemical (combustion) rockets. These thrusters are broadly categorized by their propellant acceleration mechanism into three categories: electrothermal, electrostatic, and electromagnetic. Research on plasma propulsion dates back over 60 years with a first application in space in 1964 on the Soviet Zond-2, which used an ablative pulsed plasma thruster to control the spacecraft orientation.

As the field evolved and grew over the last few decades, electric propulsion steadily became a realistic and serious alternative to chemical propulsion, and this technology is increasingly being used in different space applications internationally. This is an opportune moment to launch a new interdisciplinary platform for researchers and stakeholders to showcase and disseminate their work. The *Journal of Electric Propulsion* (JEP) will cover current and emerging topics in electric propulsion systems, and will essentially straddle the several disciplines of plasma science and technology, and astronautical engineering. In the process, the journal aims to fill a gap in the existing literature by providing a broad international and interdisciplinary forum for researchers in the field.

JEP also aims to serve as a high-level, peer-reviewed outlet for the growing community of participants at global events such as the International Electric Propulsion Conference (IEPC) and other relevant international forums. IEPC is a premier international forum for developers, researchers, managers, scholars, and students in the field of electric propulsion for spacecraft. This conference has traditionally been a venue for reporting groundbreaking developments arising from investigations on plasma propulsion.

A few words on the type of papers that we hope to see being published in the journal. Robust research and development programs are ongoing using experimental test campaigns, physical modeling, and computer simulations to contribute significantly to our overall understanding and advancement of the technology. Many new plasma thruster concepts have been recently developed, including numerous successful attempts to scale previously known systems to both lower and higher power levels, ranging from a few Watts to over 100 kW. Significant progress has been made in the field of micropropulsion offering support to the growing applications of micro- and nano-satellites. In electric thrusters, the plasma conditions span from a collisionless non-equilibrium state to that of a collisionally-dominated equilibrium plasma and are, in some cases, highly magnetized. Propellants can range from monatomic gases to ablated polymer solids, resulting in complex, non-homogenous complex plasma chemistry. To this end, significant advances have been made in the development and application of both theoretical and experimental methods for studying such plasmas. Many traditional and new plasma diagnostic tools and methods, including electrostatic and electromagnetic probes and sensors and advanced laser-based diagnostic methods have been developed to characterize the harsh and complex environments found in plasma propulsion devices. A variety of simulation techniques such as Particle-in-Cell (PIC), Direct Simulation Monte Carlo (DSMC), fluid modeling, hybrid fluid-PIC approaches, and three-dimensional analyses are now commonly used for studying thruster plasmas. Last but not least, any space propulsion approaches that are under development – such as laser propulsion, nuclear thermal propulsion, electromagnetic tethers etc. – as well as studies on the fundamental sciences of plasmas and electromagnetics directly related to electric propulsion, are also solicited.

JEP aims to publish high-quality original research papers covering all of the aforementioned aspects of plasma propulsion. Critical and comprehensive overviews of the state-of-the-art in topics of current and emerging interest in the form of Review articles, and short papers reporting significant novel findings of wide potential interest in the form of Brief Communications are also welcome. In addition, JEP is open to proposals for Special Issues that focus on the latest developments in topics relevant to electric propulsion and plasmas.

It is the goal of the Editors and the Editorial Board to strive for rigorous peer review, to ensure rapid dissemination and to ultimately provide an attractive publishing platform for the best research in electric propulsion.

Author's contributions

The author read and approved the final manuscript.

Competing interests

The author declares that he has no competing interests.

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