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Plenary Lecture
Tuesday, May 14, 8:05-9:05 am ET

Plasma in Energy Research

Abstract: Plasma – ionized gases comprised of ions, electrons, excited species, etc., holds the key to our future energy and environment. Even though plasma research has existed for more than a century, the recent technological innovations in power electronics and advanced manufacturing have opened the door to a new world for energy researchers. Biswas and his Plasma Power Propulsion Laboratory (3P Lab) at the University of Minnesota Twin Cities uses low-temperature, non-equilibrium plasmas as a tool to access unconventional chemical pathways for clean energy production, high-efficiency propulsion, and cleaner transportation. In this talk, Biswas will present a brief history of plasmas in combustion, highlight our contemporary state of understanding, and explore the immense future potential of non-equilibrium plasmas often under-researched at higher pressures relevant for energy applications. Biswas will discuss the diverse applications of plasma technology in energy and propulsion, including a) enhancing the efficacy of combustion through plasma-assisted chemical reforming of hydrocarbon fuels, b) utilizing plasmas for ‘sensing and control’ of combustion instability, c) investigating the effects of plasma discharge on the mixing of liquid jets in supersonic crossflow, d) harnessing laser-induced plasma and air shock from energetic materials to develop tailored innovative solid energetic propellants. The aim of this talk is to familiarize the audience with the fascinating world of uncharted and intricate non-equilibrium plasma physics and its potential influence on combustion science, sparking (pun intended, we will steer clear of sparks! i.e., equilibrium plasmas) their interest.

Bio:Dr. *Dr. Sayan Biswas is an Assistant Professor in Mechanical Engineering at the University of Minnesota Twin Cities. Previously, he was a postdoctoral researcher at Sandia National Laboratories Combustion Research Facility. He earned a Ph.D. in Aerospace Engineering from Purdue University in 2017. He received masters from the University of Connecticut in 2012 and bachelors from Jadavpur University, India, in 2010, both in Mechanical Engineering. At the University of Minnesota, Sayan leads Plasma Power Propulsion Laboratory – 3P Lab, developing innovative and sustainable technologies for clean and efficient future energy. His research utilizes low-temperature plasmas in next-generation of engines, carbon-neutral E-fuels for aviation and transportation, explores advanced energetic materials, and studies the fundamentals of high-speed propulsion.*