

Pulsed Power Plasma Technologies and their Applications

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Presently, there is growing concern in pulsed plasma devices and technologies, such as, high power plasma switches (Thyratron and pseudospark switch (PSS)) for different pulse modulator and high energy physics applications; high density and energetic electron beam sources for microwave and surface modification applications; Extreme Ultraviolet (EUV)/X-ray sources for surface modification of polymers, X-ray Crystal Spectroscopy (XRCS) and radiography of small objects for potential biological applications; and plasma assisted compact microwave and THz sources [1-17]. Keeping in view of these applications, CSIR-CEERI has initiated the research activities on pulsed plasma devices and technologies, particularly thyratron switches and pseudospark (PS) discharge devices in early 2000 [3-4]. The talk has covered the recent technological efforts made by CSIR-CEERI for the design, development and characterization of high power plasma switches, such as, Thyratrons (25kV/1kA, 35kV/3kA and 40kV/3kA) and PSS (25kV/5kA, 40kV/10kA and 20kV/100kA) for different pulse power applications of strategic importance [3-8]. Such plasma switches are presently being imported and have always been a subject to import restrictions, causing hurdles in Indian efforts for advancing technologies in high energy research areas. The design, fabrication, processing, development and characterization issues of these plasma switches have been presented. The research work on development of high voltage (≥ 30 kV) and high current (≥ 5 kA) PSS and thyratrons for high energy applications has also been presented. The recent research work on the few PS discharge based plasma cathode electron (PCE) guns for the generation of high energetic, intense and focused electron beams and also their applications for plasma-assisted slow wave oscillator 'Pasotron' will also be presented [9-14]. Discussions have also been made for the areas of further research on novel pseudospark (PS) discharge technologies for the generation of EUV/X-ray radiations for the potential biological, spectroscopy and surface modification applications [15-17].

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