Seminar

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Institute for Plasma Research

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Title: Numerical modelling of an arc plasma and its interaction with the anode

Speaker: Dr. Abin Rejeesh AD
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Date: 26th April 2022 (Wednesday)

Time: 03:30 PM

Venue: Join the talk online:
https://meet.ipr.res.in/viewer/1886945733?be_auth=MDQ3NjA5
(Conference ID: 1886945733; Password: 047609)

Abstract

The thermal plasma process has evolved as an important technique for the synthesis of various nanomaterials due to huge advantages over other methods. Researchers have shown keen interest in modelling of the process using the conservation laws and Maxwell's electromagnetic equations with the aim to obtain nanomaterials with desired size distribution of the particles.

In the present work, a computational study has been carried out with the aim to obtain metal/metal oxide nanoparticles with narrow size distribution. In a free-burning transferred arc plasma, an electric arc is struck between electrodes, forming the plasma. The high temperature of the plasma is enough to melt and evaporate materials. The plasma plume heats the anode workpiece to its melting point, which eventually leads to its evaporation. Nano particles are formed via vapour phase nucleation and growth of evaporated species.

In order to simulate the nucleation and growth, details of vapour flux is essential, this in turn is dependent on the arc plasma properties. To achieve this objective a numerical simulation is carried out to estimate the profiles of temperature, velocity, potential and current density. The results are obtained for a free burning argon arc using an opensource package OpenFoam and modified the solver to include the Maxwell's equations for the arc phenomena called arcFoam. The validation and results obtained with the free burning benchmarking argon arc will be presented in the talk. The solutions of the conservation equations with appropriate boundary conditions have been obtained for a current range from 100 to 300 A with electrode gaps of 10 mm.
