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Seminar

Institute for Plasma Research

Title : Comparative study between gas and liquid medium synthesized nanoparticles with thermal plasma method

Speaker: Dr. Arkaprava Das
FCIPT, Institute for Plasma Research,
Gandhinagar

Date : 21st June 2021 (Monday)

Time : 10:30 AM

Venue : Online - Join the talk:

<https://meet.ipr.res.in/PDFextensiontalk-ArkapravaDas>

Abstract :

The advantage of synthesizing metal nanoparticles with narrower particle size distribution in liquid medium with thermal arc plasma technique has triggered us to perform a comparative study between gas and liquid medium synthesized nanoparticles. We have performed high temperature arc plasma route synthesis of tin oxide nanoparticle in water as well as in air medium. X-ray diffraction analysis reveals the presence of cubic metallic Sn phase in water whereas air ambient synthesized nanoparticles is found to exist only in tetragonal SnO phase. In water, after emerging out from the plume, atoms starts to cool down immediately and due to unavailability of free oxygen atoms, some unreacted Sn atoms form a separate metallic phase. Scanning electron microscopy manifests higher crystallinity for SnO nanoparticles in air medium but on the other hand water medium synthesized nanoparticles show low crystallinity and changed morphology. The oxygen vacancies/interstitial or Sn vacancies/interstitial might be the probable reason for modified morphology. These results will be discussed in the talk. To produce only metal nanoparticles without any oxide phase, instead of water, studies with different electrolytic solutions need to be performed which is the planned activity in the extended period.

We have also performed a comparative study for iron oxide nanoparticles synthesized in air and He medium. The structural, electronic and microscopic properties reveal the presence of metallic Fe phase at higher arc current. Further the M-H loops manifests a fluctuating coercivity with varying arc current in He ambience due to the presence of core shell type nanostructure. These well correlated outcomes exhibit in-depth information regarding different phase formation and its impact upon different physical properties and applications. These results will also be discussed during the talk.
