Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **4044** Type: **Invited Speaker / Conférencier(ère) invité(e)**

(I) Production of nanomaterials by pulsed electrical discharges in and at the interface of two liquids

Tuesday 20 June 2023 09:00 (30 minutes)

The field of nanotechnology has rapidly expanded over the past few decades due to the unique physical, chemical, mechanical, and electrical properties of nanoscale materials. Today, nanomaterials are applied in numerous fields, including catalysis, drug delivery, and microelectronics, among others. Plasma-based methods have shown great potential for use in the synthesis of nanomaterials via bottom-up or top-down approaches. The plasma-liquid system is a relatively novel field of research that has shown high efficiency in synthesizing nanomaterials. In this system, the plasma is either i) generated in a gas phase that is in contact with the liquid or ii) generated directly in the liquid (with or without bubble assistance).

In this communication, we will focus on the production of nanomaterials using in-liquid discharges, more particularly those eroding the electrodes in a controlled way. First, we will show that the produced particles are highly sensitive to both, electrode nature and liquid composition. In a second part, we will introduce a novel plasma-liquid system in which a spark discharge is used to generate plasma in a liquid that is in contact with another liquid (combination of type (i) and type (ii) systems). A brief review of the discharge electrical and optical characteristics, we will provide the synthesis conditions, i.e. those leading to a spark discharge between a pin electrode immersed in a dielectric liquid (heptane) and the surface of a conductive solution (water + metal salts). This configuration guarantees an interaction between the high-density plasma (spark in liquid heptane) and the solution that contains metal ions, and so, we used it herein to synthesize metal nanoparticles as well as binary and ternary nanoalloys.

Presenter: Prof. HAMDAN, Ahmad

Session Classification: (DPP) T1-2 Plasma Physics Symposium I | Symposium de physique des plasmas I (DPP)