Minicolloque n° CPR3 ☒ **Oral** ☐ **Poster**

Large-area Nanosensors Based on Self-assembled Bimetallic Nanostructures

Abeer Fahes[a], Aotmane En Naciri[a], Mohammad Navvabpour[b], Safi Jradi[b], and Suzanna Akil[a*]

a. Laboratoire de Chimie-Physique Approche Multiéchelle des Milieux Complexes (LCP-A2MC), Université de Lorraine, 1 Boulevard Arago, 57070 Metz, France.
b. Laboratoire de Nanotechnologie et d'Instrumentation Optique (LNIO), Université de Technologie de Troyes, 12 rue Marie Curie, 10004 Troyes, France.

* email : suzanna.akil@univ-lorraine.fr

The incorporation of two metallic nanoparticles (MNPs) into one system has enormous benefits in achieving advanced multifunctional nanomaterials in diverse applications such as catalysis, Surface-enhanced Raman Scattering (SERS), localized surface plasmon resonance (LSPR) sensors, and photothermal conversion [1]. Recently, an unprecedented approach known as Vapor Induced Phase Separation (VIPS) was developed for the fabrication of precisely shaped gold nanoparticles embedded in a poly (methyl-methacrylate) PMMA layer [2]. The main principle of this technique relies on the self-assembly of PMMA thin layer into nanoholes, which are used as MNPs synthesis reactors. Among several synthetic procedures, VIPS is considered as a powerful and simple route because it provides excellent control of structural properties of NPs. It offers compelling evidence for producing efficient SERS platforms with controlled size, shape, and interparticle gap distances [3,4]. Inspired by this approach, we aim to fabricate multifunctional hybrid nanomaterials such as Ag-Au bimetallic nanoparticles (BNPs). This is a new insight in the synthesis of BNPs by a surface-based strategy. Precisely, we carried out a parametric study dealing with the influence of different experimental parameters on optical and structural properties of monometallic and BNPs. The optical properties of synthesized BNPs substrates were analyzed by micro-extinction and ellipsometric measurements. Ultimately, the significance of the present work lies in assuring the effectiveness of the substrates produced in SERS applications by inducing highly sensitive, stable, and reproducible SERS substrates over a large scale.

[1]. M. Chen, Y. He, & J. Zhu, International Journal of Heat and Mass Transfer. 114, 1098-1104 (2017).
[2]. R. Omar, A. E. Naciri, S. Jradi, et al., Journal of Materials Chemistry C. 5(41), 10813-10821 (2017).
[3]. R. Omar, A. E. Naciri, A. Fahes, et al., Soft Matter. 16(7), 1857-1865 (2020).
[4]. S. Akil-Jradi, S. Jradi, J. Plain, et al., RSC advances. 2(20), 7837-7842 (2012).

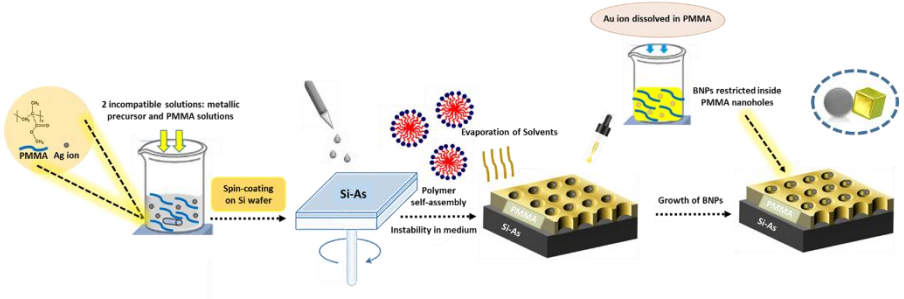

Figure 1: Schematic illustration for the fabrication of Ag-Au BNPs by VIPS approach