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Raman and SERS performances of PDA-coated silver and gold nano-objects for emerging pollutants monitoring

The need for stable, reusable, and efficient SERS chips is crucial for label-free trace detection of organic molecules in real environments. We studied the SERS properties of Gold nanostars (GNS) and Silver nanospheres (AgNS) coated with an ultra-thin layer of polydopamine (PDA). SERS responses of standard Raman reporters were investigated at different PDA thicknesses (0-10 nm). The decay of the enhancement factors allowed to monitor the behavior of average local electric fields, also modeled by boundary element method, and to understand the role of geometrical constraints, aggregation and/or chemical affinity. The SERS performances were tested in terms of surface reproducibility, stability over time and enhancement factors. We found that 1-2 nm thick PDA layers improve SERS performances especially towards Methylene Blue. On these bases possible applications in the detection of emerging pollutants like nano-plastics and antibiotics are discussed as well as the on-site monitoring of food and beverage safety.

Primary author: GALINETTO, PIETRO

Co-authors: Prof. TAGLIETTI, Angelo Maria (Dipartimento di Chimica, Università di Pavia); PELLEGRINI, GIOVANNI; PATRINI, MADDALENA; Dr PRAKASH, Om (Dipartimento di Fisica "A. Volta", Università di Pavia); Dr SCHIAVI, Serena (Dipartimento di Chimica, Università di Pavia)

Presenter: GALINETTO, PIETRO

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