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Abstract

Polydopamine decorated *in-situ* with Localized Surface Plasmon Resonance (LSPR)-active gold nanoparticles (AuNPs) may extend the applicability of nanoplasmonic materials to original and innovative applications in several fields. Here we report the modification of disposable UV-Vis polystyrene cuvettes with AuNPs@PDA for refractive index LSPR-based measurements. An original layer-by-layer deposition method of PDA followed by AuNPs growth is here developed, showing linear correlation between PDA thickness and optical properties. In particular, the modulation from wavelength sensitivity toward absorbance sensitivity is obtained, allowing measurements at fixed wavelength (578 nm). As applicative example of the photonic cuvettes, the measurement of fermentable sugars in beer wort is here reported. The analytical performance of our approach has been directly compared to portable refractometer of reference, displaying excellent results in terms of the precise estimation of sugars in beer wort (expressed in degrees Brix), reproducibility and sensitivity. The approach may be extended to other materials of interest in LSPR based optical sensors, *e.g.* optical fibers.

Keywords: Polydopamine; gold nanoparticles; localized surface plasmon resonance; refractometer; food analysis, beer.

Acronyms list: DA, dopamine; PDA, polydopamine; NPs, nanoparticles; MNPs, metallic nanoparticles; AuNPs, gold nanoparticles; LSPR, localized surface plasmon resonance; RIU, refractive index unit; RIS, refractive index sensitivity; S_λ, wavelength sensitivity; S_{Abs}, absorbance sensitivity; °Bx, degrees Brix; LBL, layer-by-layer; CV_{av}%, percentage coefficient of variation (relative standard deviation) averaged on measurements; $\Delta\lambda_{max}$, maximum wavelength shift.