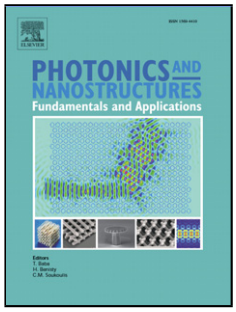

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Optical Properties of Silver Nanoplates and Perspectives for Biomedical Applications

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Highlights

- We investigate the optical properties of Ag nanotriangles and evaluate the feasibility of using it on LSPR biosensing and on photodynamic therapy.
- A theoretical approach based on EM–Np interaction simulation guide the selection of the nanoparticle structure, leading to high performance of AgNPls solution-based platform for sensing and PDT.
- We report a high bulk sensitivity value (406 nm/RIU) for Ag nanotriangles. The obtained value is considerably high for a colloidal sensing platform.
- We observed 220% increase of the oxygen single generation due to the nanotriangles (the highest enhance factor reported on a colloidal phase), indicating the potential use of the nanostructure on PDT.

Abstract Silver nanoplates of triangular shapes have attractive optical extinction spectrum with multipolar resonance modes. In this work, we investigate the optical properties of Ag nanotriangles and evaluate the feasibility of using it on LSPR biosensing and on photodynamic therapy. Three dimensional finite element simulation and experimental analyses were explored on the assessment of the LSPR spectrum and spatial distribution of the electromagnetic field enhancement near metallic nanoplates, with different altitude length and thickness. Refractive index based sensitivity (406 nm/RIU) and figure of merit (2.6) values were measured for AgNPls colloids, and attributed to dipole LSPR near field enhancement at the tips of the nanostructure. It was observed that LSPR field enhancement extend for more than 18 nm from the nanoparticle surface, indicating the viability of using the nanoplates on molecular sensing. The interaction of Ag nanoplates with Methylene Blue photosensitizer was also appraised, and a 2.2–fold metal enhanced single oxygen generation was determined. Our results indicate that Ag nanotriangles are promising candidates for biosensing and photodynamic application.

Keywords Localized surface plasmon resonance, Silver nanoplates, Sensitivity, Photodynamic therapy.