XXI Brazilian Meeting on Inorganic Chemistry
X Brazilian Meeting on Rare Earths
III Workshop on Theoretical Bioinorganic Chemistry
Belo Horizonte, September 12 - 15th 2024

Stability of prismatic silver nanoparticles with N-doped graphene oxide quantum dots

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Thematic Area: Materials Chemistry

Keywords: Silver nanoparticles, graphene oxide quantum dots, nanochemistry

Prismatic silver nanoplates (pAgNPs) hold promise for medical applications, offering advantages such as easy tunability and low-cost synthesis. However, their instability arises from high surface energy and specific crystallographic facets, making them particularly vulnerable to rounding in the presence of halide anions like Cl^-, commonly used in biological tests in high concentrations of NaCl and KCl salts.[1] To mitigate this problem, pAgNPs are decorated onto the surface of N-doped graphene oxide quantum dots (N-GOQD) through electrostatic interactions. This carbonaceous nanoparticle is chosen for its low toxicity, good water solubility, and high affinity to pAgNPs,[2] enhancing the stability of these metallic nanoparticles, and thus improving their performance in various biological applications, such as photodynamic therapy. The pAgNPs were synthesized following a modified version of Zhang et al.'s method.[3] The resulting hybrid nanocomposite, pAgNP-N-GOQD, was synthesized through a direct reaction between pAgNP and N-GOQD using an ultrasound bath. Scanning electron microscopy (SEM) confirms the retention of triangular shape in pAgNP-N-GOQD, while dynamic light scattering (DLS) reveals an increased hydrodynamic radius. UV-Vis spectroscopy of bare pAgNPs with NaCl 154 mM shows immediate degradation, indicated by a significant blue shift of the LSPR band (~650 to ~400 nm). In contrast, with the additions of N-GOQD, a small blue shift in the LSPR band is noted (~650 to ~550 nm), indicating the stabilization of pAgNP-N-GOQD. This suggests the potential of N-GOQDs as effective stabilizers for pAgNPs in biological and medical applications.

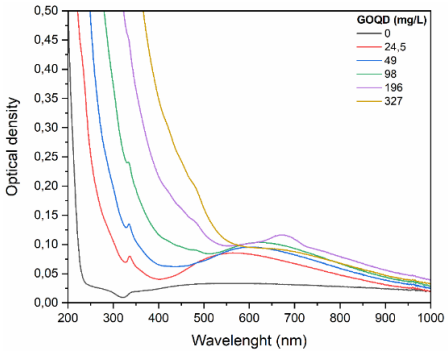

Figure. UV-Vis of the resulting suspensions containing tAgNP and different concentrations of N-GOQD in the presence of NaCl 154 mM.

Acknowledgments: FAPERJ.

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