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Thin and transparent films of PEDOT/gold nanoparticles: preparation and characterization

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Conductive polymers have unique electronic and optical properties. Among these polymers, (3,4-ethylenedioxythiophene) also known as PEDOT, presents high conductivity and good charge mobility due to non-covalent interactions between PEDOT chains.[1] Such polymer can be combined with gols nanoparticles (AuNPs), which present optical properties modulated according to their sizes and shapes. By varying reaction parameters, it is possible to obtain nanocomposites between PEDOT and AuNPs with synergistic properties. The aim of this work was to obtain nanocomposite thin films between PEDOT and AuNPs through a spontaneous reaction between the monomer EDOT and tetrachloroauricacid($HAuCl_4$), in the absence of PSS and in a single step. The nanocomposites were prepared through the liquid-liquid interfacial route, which consists of obtaining nanocomposite thin films at the interface between two immiscible solvents.[2] The two-phase systems studied were composed of an aqueous phase and an organic phase, containing EDOT and $HAuCl_4$, respectively. Samples were obtained with different reaction times and different proportions between precursors. All the samples were obtained varying the ratio between the precursors, and characterized by UV-Vis and Raman spectroscopy, XRD, and SEM-EDS. The characterizations show the spontaneous polymerization of EDOT concomitant to AuNPs formation. By varying the molar ratio of EDOT/$AuCl_4^-$, it was possible to obtain AuNPs of different sizes and nanocomposites with different electronic properties. Additional characterization techniques are being conducted to propose the mechanism of formation of these nanocomposites, as well as the type of interaction between AuNPs and PEDOT.

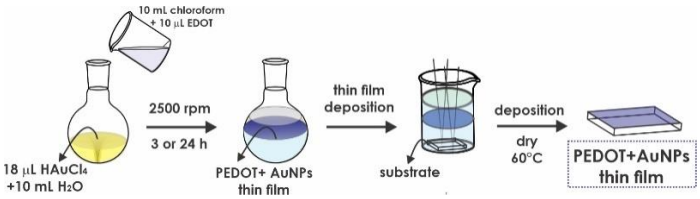

Figure: liquid-liquid interfacial methodology

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References

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