

Synthesis of poly(3,4-ethylenedioxythiophene)(PEDOT) hollow nano-spheres and nano-bowls using Ouzo effect

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Ouzo effect is well-known for surfactant-free stable emulsion formation. We have demonstrated the successful formation of stable emulsion in the mixture of oxidants such as  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ , acetone as solvent, and toluene as anti-solvent, characterized by dynamic light scattering. Due to excess amount of anti-solvent, the formed emulsion droplets are largely composed of solvent and oxidant with small amount of anti-solvent because of mutual miscibility between solvent and anti-solvent. Upon the addition of EDOT monomer into the Ouzo emulsion of oxidant, polymerization reaction starts from the outer boundary of individual emulsion droplets, leading to the formation of hollow sphere of conductive polymer, PEDOT. Depending on sphere size and shell thickness, the hollow sphere has collapsed into nano-bowl, due to mechanical stress. This hollow sphere to nano-bowl transition has been analyzed by mechanical modeling. Also, it could be successfully controlled for the generation of sphere or nano-bowl, by varying various parameters such as concentrations of constituents.