

Green synthesis of gold nanoparticles supported in nanocrystalline cellulose (AuNPs@CNCs) with catalytic activity

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Hairy nanocellulose functionalized with carboxylic groups, known as electrostatically stabilized nanocrystalline cellulose (CNC)¹, was used to facilitate the synthesis of gold nanoparticles (AuNP). The CNC was used as an AuNP support and, as a result, the AuNPs@CNC nanocomposites were formed through a cost-effective and easy method by UV radiation in a chamber. The nanocomposites were characterized by ultraviolet-visible spectroscopy (UV-vis), transmission electron microscopy (TEM), and x-ray photoelectron spectroscopy (XPS). The results indicate that size distribution and shape of the Au nanoparticles changes with radiation time, Au concentration and the carboxylic content of the CNC.

The catalytic activity of the nanocomposites was tested for the reduction of 4-nitrophenol (4-NP) to 4-aminophenol with an excess amount of NaBH₄. Gold nanoparticles supported on CNC showed better catalytic activity and stability than other Au-nanocomposites previously reported^{2,3}. This green method contributes to undergoing efforts for sustainable development of nanomaterials.

References

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- [2] Wu X., Lu C., Zhou Z., Yuan G., Xiong R. and Zhang X., *Environ. Sci.: Nano*, 1 (2014) 71–79
- [3] Yan W., Chen C., Wang L., Zhang D., Li A-J, Yao Z., Shi L-Y., *Carbohydrate Polymers* 140 (2016) 66–73.

Figures

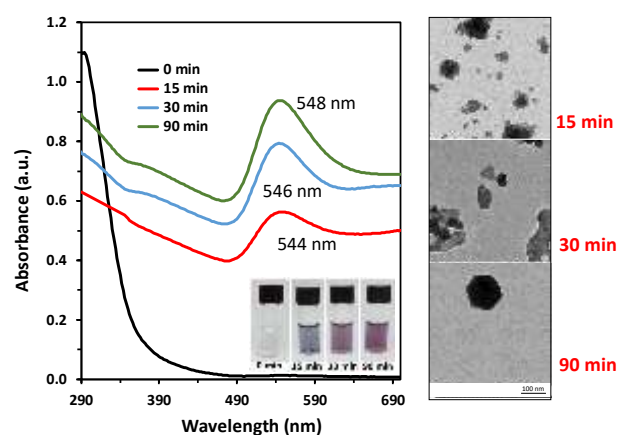


Figure 1: TEM Images and UV-vis absorption spectra of formed AuNPs@CNC nanocomposite after different UV radiation times with CNC (-COOH 6.1 mmol/g and hydrodynamic diameter 280 nm) and Au concentration of 0.25 mM HAuCl₄

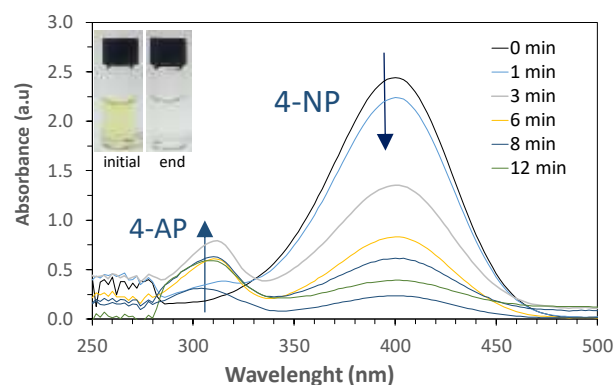


Figure 2: Time dependent UV-spectra for the reduction of 4-NP catalysed with the nanocomposite formed by 15 min uv radiation in a chamber, AuNPs(0.25mM)@CNC(-COOH 6.1 mmol/g and hydrodynamic diameter 280 nm), with an excess amount of NaBH₄ in aqueous media.