

Green synthesis of platinum nanoparticles using honey solution



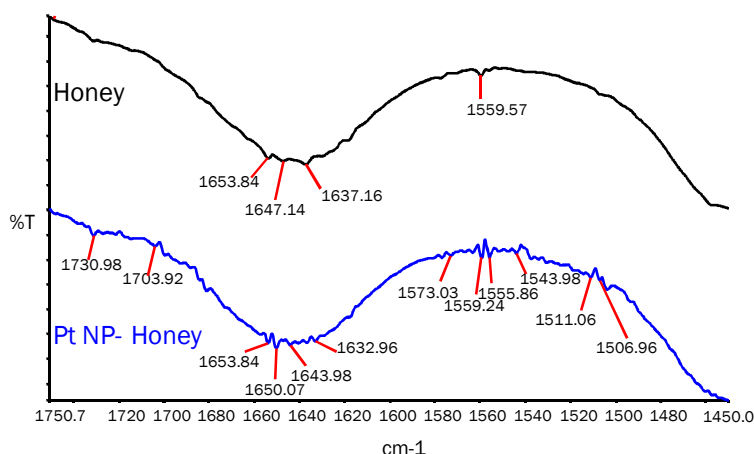
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The noble metal nanoparticles (Au, Ag, and Pt) play an important role in pharmaceuticals, photocatalysts and sensors. In present, research studies confirmed the fact that a number of metallic nanoparticles-based therapeutic agents have been developed for the treatment of cancer, diabetes, asthma (1, 2).

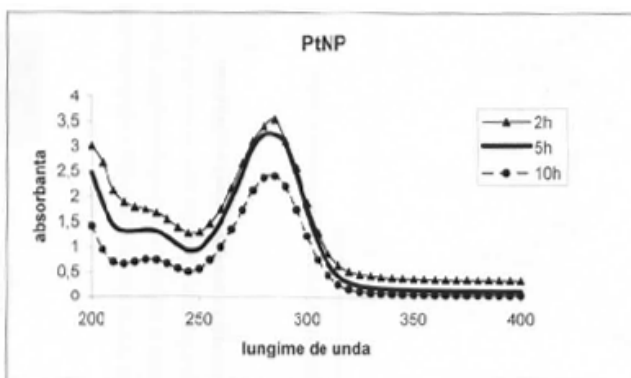
In the present study, we have developed a novel green, bio-directed and economically method for the preparation and synthesis of platinum nanoparticles (PtNP) using a bio-derived product-honey.

Honey is a sweet viscous fluid produced from bees, rich in vitamins, enzymes, minerals, antioxidants and carbohydrates. So, we report a bio-directed greener and economically method for the fabrication of PtNP by thermal treatment using aqueous honey solutions. The mixture prepared, between H_2PtCl_6 and aqueous honey solution, was kept in the oven for different reaction times: 2h, 5h and 10 h. The final solution was characterized by ultraviolet-visible spectroscopy (UV-VIS) and Fourier Transform Infrared Spectroscopy (FTIR).



FT-IR studies suggest the obtained PtNP were bound to protein from honey through the carboxylate ion group. The possible biomolecules responsible for stabilization of PtNP, characterized using FTIR method, suggests the fact that proteins can bind to nanoparticles through either free amine groups ($405-484\text{ nm}$, $587, 610\text{ cm}^{-1}$), amides ($1544, 1650\text{ cm}^{-1}$), esters ($1703, 1730\text{ cm}^{-1}$) or carboxylate ions of the amino acid residues ($1504, 1507, 1511\text{ cm}^{-1}$) (3, 4). So, stabilization of the nanoparticles by surface-bound protein has been proved.

UV-VIS analysis confirmed the formation of platinum nanoparticles, by the appearance of specific absorption peak (285 nm).



In *conclusion*, a biodirected, simple green method has been applied for the synthesis of platinum nanoparticles, using aqueous honey solutions. The spectroscopic techniques (UV-VIS and FT-IR) studies suggest that the honey has played an important role in the reduction and stabilization of platinum nanoparticles through the electrostatic interaction of carboxylate ion groups of amino acid residues in protein with platinum.

References:

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