

Production of Silver Nanoparticles by Spent Coffee Grounds Extracts

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Spent coffee grounds (SCG) hydro-alcoholic phenolic extracts were employed to synthesize spherical silver nanoparticles (AgNPs) through a novel green method. The reduction of AgNPs was performed employing an aqueous solution of silver nitrate as a precursor and the phenolic compounds recovered from SCG as reducing and capping agents. The formation of AgNPs was monitored spectrophotometrically, measuring the intensity of surface plasmon resonance (SPR) band at 405-430 nm. The synthesis of AgNPs was achieved in 5 hours. A central composite design coupled with response surface methodology was used to evaluate the effect of process variables, such as temperature (10-70 °C), pH (7-13), ethanol titer in the hydro-alcoholic extracts (10-90%) and silver to polyphenols ratio (1-9 mol/mol) on the SPR peak intensity and wavelength. A good agreement between experimental and predicted data was observed. Transmission Electron Microscopy (TEM) observations showed that the AgNPs obtained were spherical. X-Ray Diffraction (XRD) patterns were acquired to assess the crystalline structure of the AgNPs, which exhibited a cubic face centered lattice. The zeta-potential and mean hydrodynamic diameter were measured through Dynamic Light Scattering (DLS) technique.

Biography:

Antonio Zuorro is Assistant Professor of Chemical Engineering Fundamentals at the Department of Chemical Engineering Materials & Environment of Sapienza University of Rome, where he received his M.S. and Ph.D degrees in Chemical Engineering. His research activity has been mainly focused on the development of innovative chemical and biotechnological processes for the recovery of high value-added compounds from by-products and agro-industrial residues, such as lycopene from tomato waste and phenolic antioxidants from artichoke and bilberries waste, olive pomace and coffee grounds. He also examined the possibility of including the extracts obtained in consumer food products to get new functional foods with high antioxidant activity. In the field of enzyme technology, he studied the use of multi enzyme systems with enhanced activity for the recovery of lipids and bioactive compounds with high added value from microalgae. He is the author of over 60 scientific publications and also co-author of five industrial patents.