

Facile Synthesis of PVP-Coated Silver Nanoparticles and Evaluation of their Physico-Chemical, Antimicrobial and Toxic Activity

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Experimental

Synthesis of Silver Nanoparticles (AgNPs)

The solutions of silver nitrate (AgNO_3) (AgNO_3 , 99.9% Sigma-Aldrich, Brazil 4.5 mmol) and PVP (PVP, M_w 10,000, $(\text{C}_6\text{H}_9\text{NO})_n$, 99% Sigma-Aldrich, Brazil, 4.5 mmol (molar number referent to PVP monomeric unit)) were prepared separately by dissolving the respective precursors in 50 mL of anhydrous ethanol ($\text{C}_2\text{H}_5\text{OH}$, Synth 99.8%, Brazil). Subsequently, the reaction system was kept under reflux and constant stirring for 4 h at 80 °C (Figure S1). The experiments were carried out in order to obtain uniform particles with a narrow particle size distribution.

The experiments with different reactional conditions were carried out in a procedure similar to the one previously mentioned, and it was evaluated their effects on the size of AgNPs and their microbiological activity.

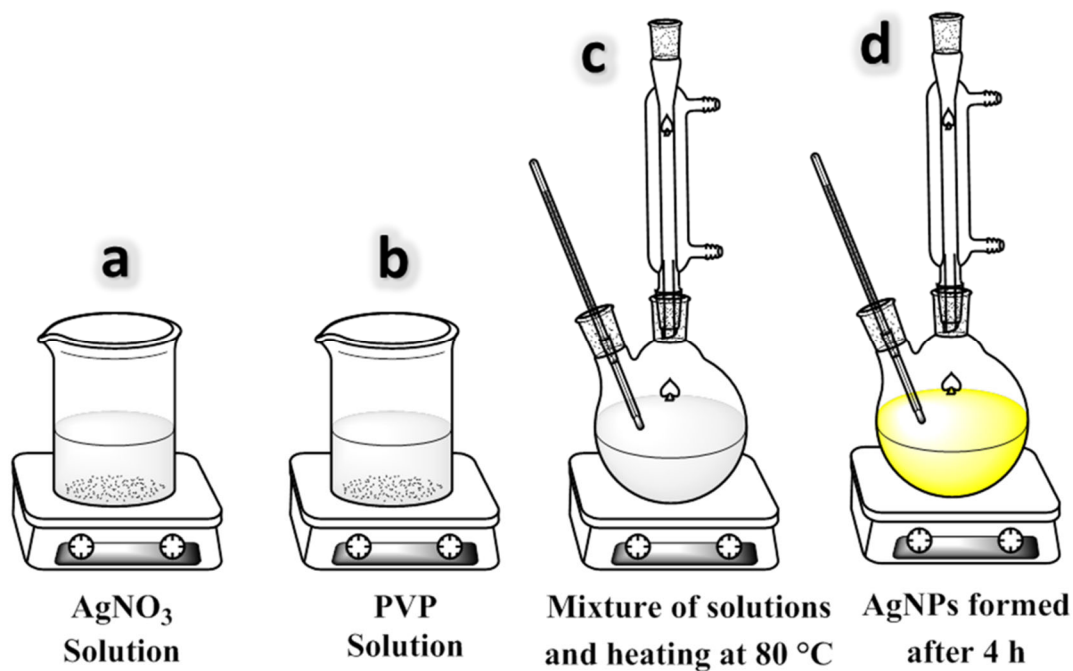


Figure S1: Schematic representation of synthesis of silver nanoparticles in alcoholic medium.

Results

UV-Vis Spectroscopy (UV-Vis)

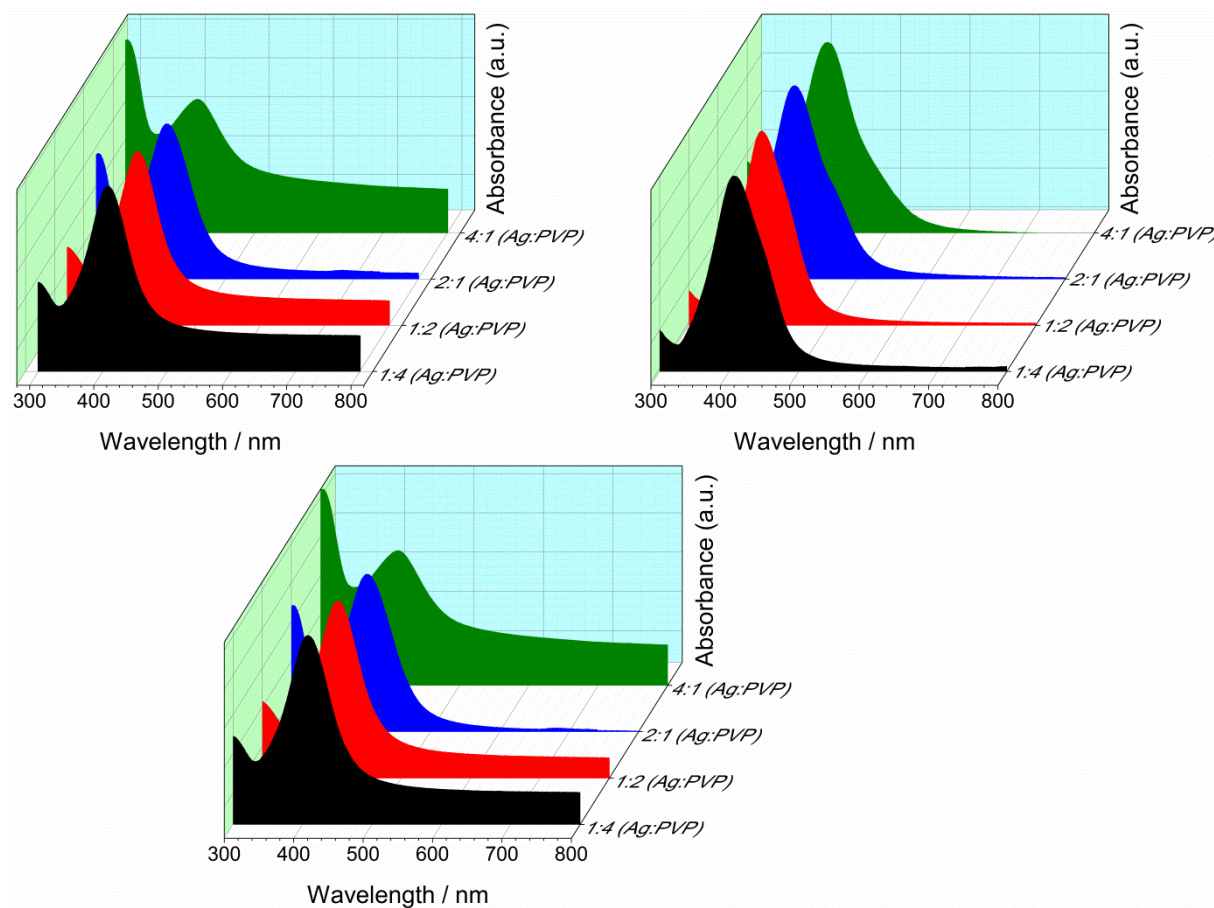


Figure S2: UV-Vis spectra of synthesized AgNPs at different concentrations and average molecular weights of PVP. A: average molecular weights of PVP 10K. B: average molecular weights of PVP 40K. C: average molecular weights of PVP 360K.

X-ray Diffraction (XRD)

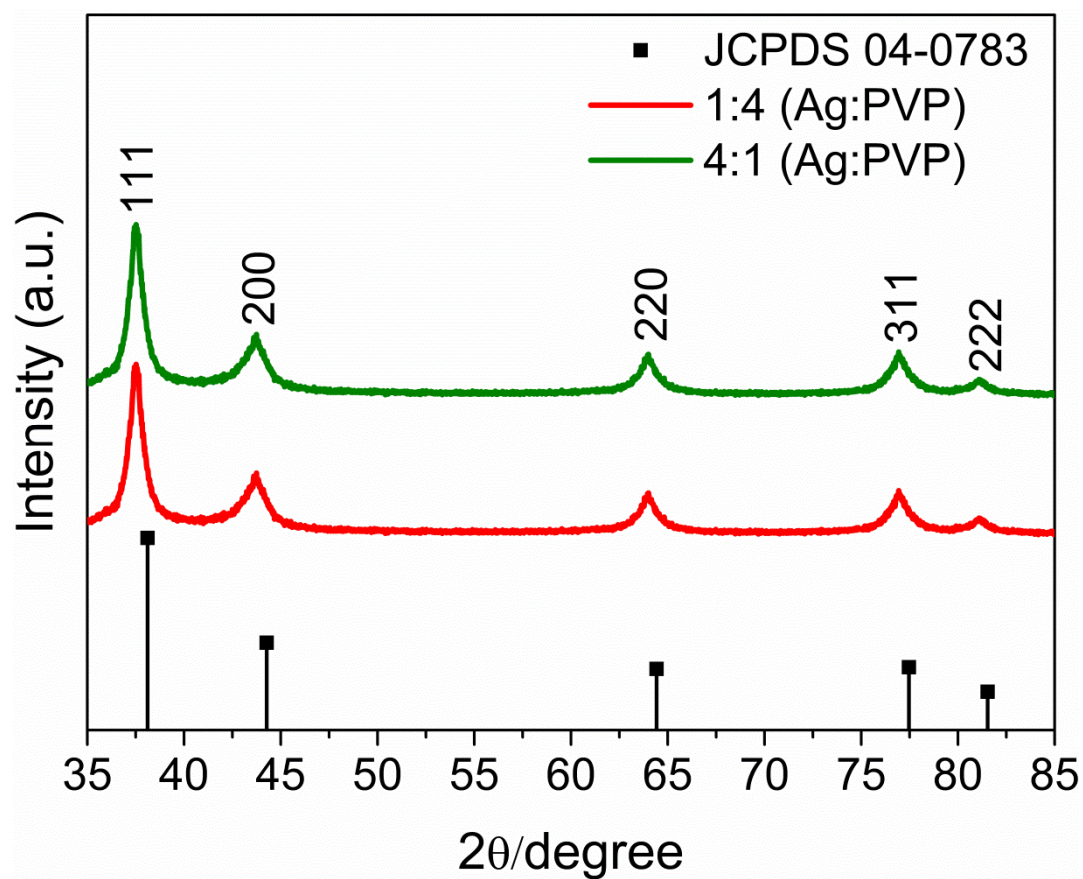


Figure S3: X-ray diffractograms of AgNPs at different concentrations and average molecular weights of PVP 10K.

Scanning Electron Microscopy (SEM)

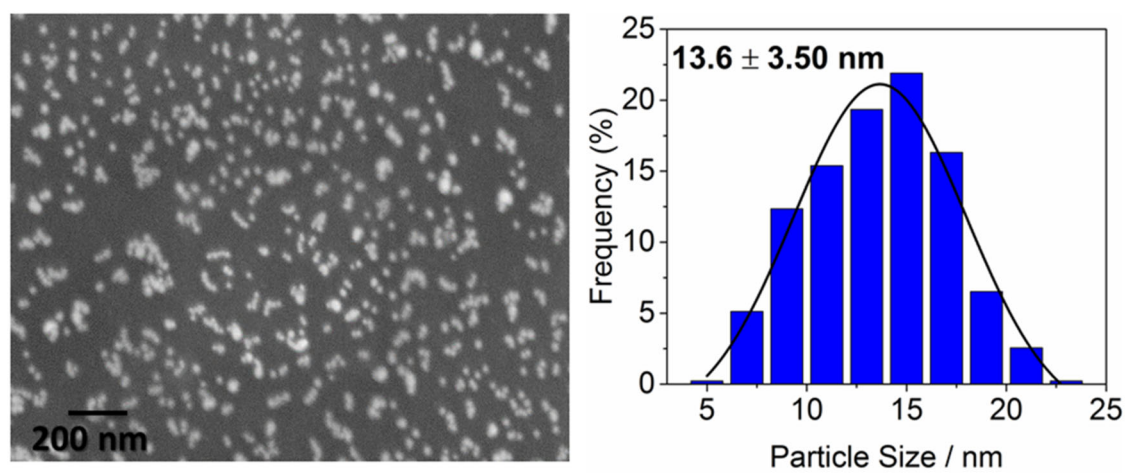


Figure S4: SEM micrographs of AgNPs and particle size distribution (2:1 Ag:PVP 10K).

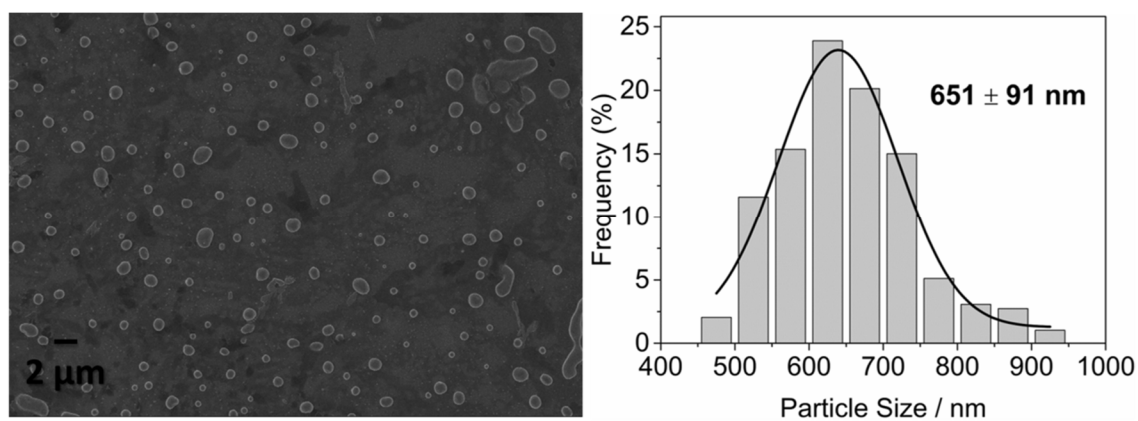


Figure S5: SEM micrographs of AgNPs and particle size distribution (4:1 Ag:PVP 10K).

Dynamic Light Scattering (DLS)

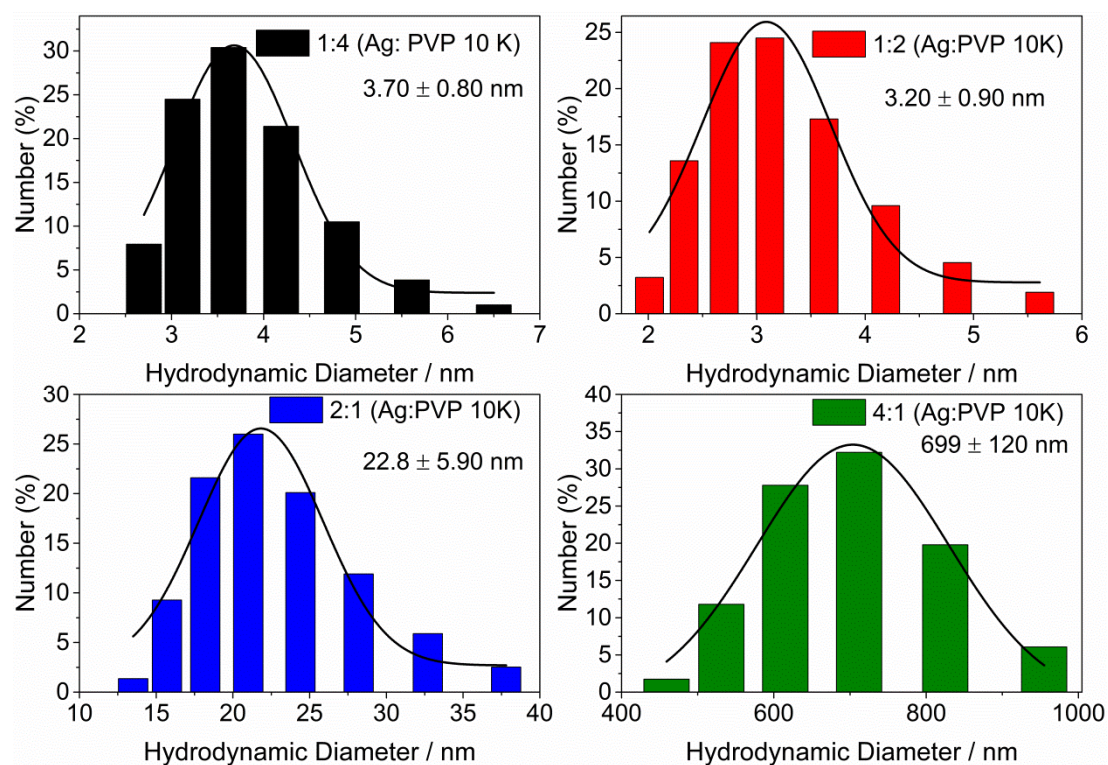


Figure S6: Size distribution by number (%) of hydrodynamic diameter at different concentrations and average molecular weights of PVP 10K.

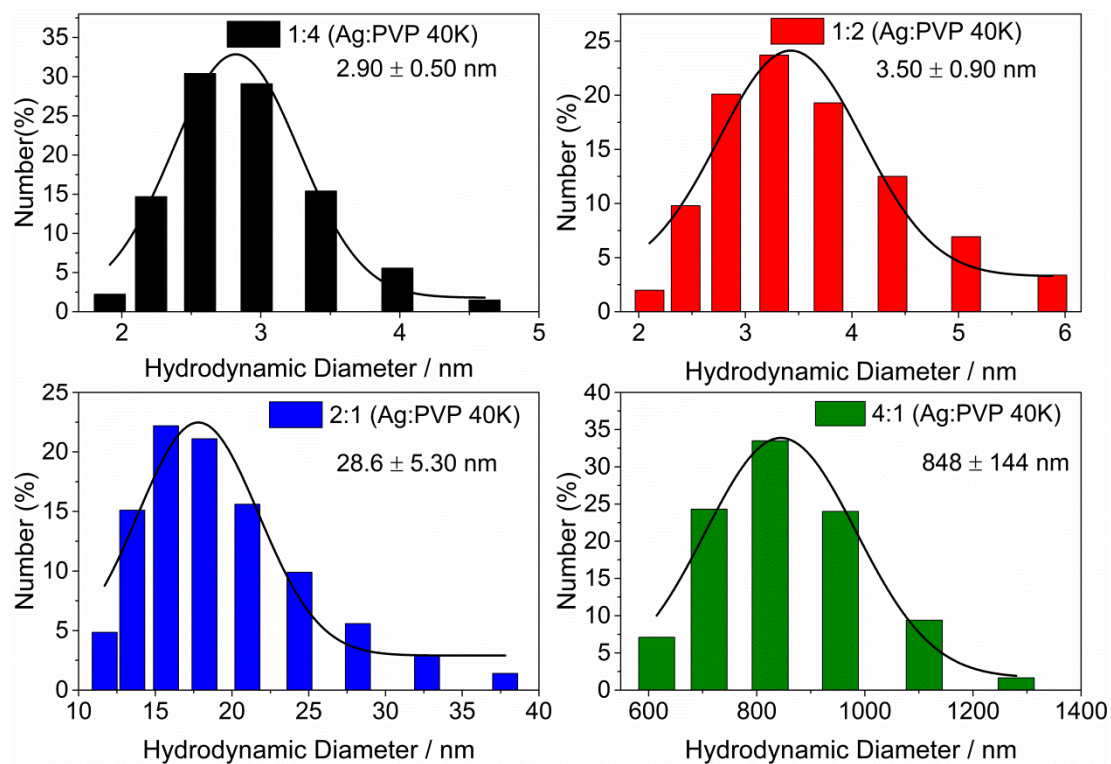


Figure S7: Size distribution by number (%) of hydrodynamic diameter at different concentrations and average molecular weights of PVP 40K.

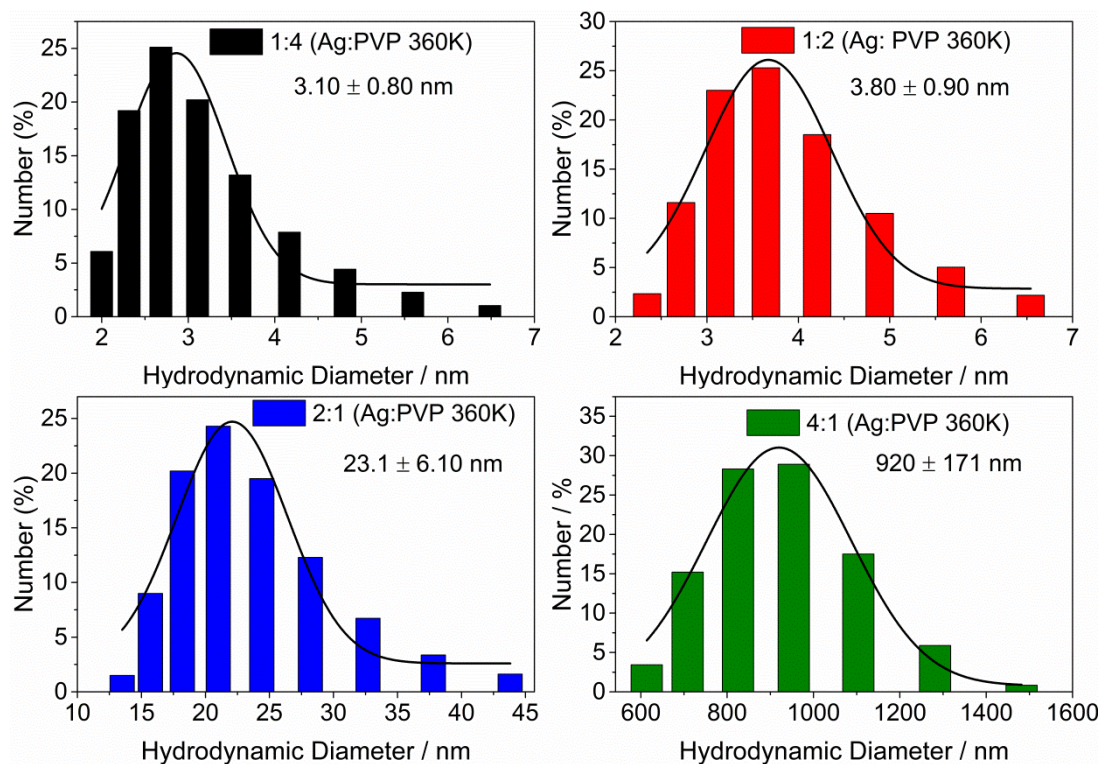


Figure S8: Size distribution by number (%) of hydrodynamic diameter at different concentrations and average molecular weights of PVP 360K.