

SYNTHESIS OF SILVER NANOWIRES FOR APPLICATION IN FLEXIBLE AND TRANSPARENT ELECTRODES

F. B. Soares¹, S. A. Lourenço², Carlos Eduardo Cava^{2,*.#}

¹Department of Physics, State University of Londrina, CP6001, 86051-990 Londrina, PR, Brazil,

²Department of Materials Science and Engineering, Technological Federal University of Paraná (UTFPR), 86036-370, Londrina, PR, Brazil.

#Corresponding author: carloscava@utfpr.edu.br

This work presents the synthesis and optical characterization of Silver nanowires (AgNWs) made by polyol route. Three ethylene glycol (EG) solutions are prepared: a with polyvinylpyrrolidone (PVP), other with sodium chloride (NaCl), and other with silver nitrate (AgNO₃). The first two are heated at a characteristic temperature and then mixed. The third is added slowly into the heated mixture. The concentration of each solution is a very important factor for the synthesis efficiency, as well as the temperature and time that the solution remains heated and stirred. The whole process is done in hot plates with magnetic stirrer. Thus, an EG solution with dispersed silver-nanowires and nanospheres are obtained. At the end of this process, the nanowires also have adsorbed PVP layer that allowed growth in a single direction. PVP layer electrically isolates the contact between the wires of the network, affecting the formation of conductive films. A washing procedure is necessary to remove the excess of PVP. The first step is dilute the solution in acetone to decant the nanowires. Then makes up a sequence of dispersions in ethanol followed by centrifugations. Each centrifugation, much of PVP and silver nanoparticles remain in the supernatant, leaving only the AgNWs in the precipitate. The characterization of AgNW solution was done by UV-Vis optical absorption (OA). The surface plasmon resonance of nanowires and nanoparticles is responsible for the pronounceable peak in the OA spectrum. After synthesis and optical characterization, conductive and transparent films were constructed by using various thin film technique deposition, as spray and Meyer Rod techniques.