

Adjusting the polyol reaction conditions to obtain a quasi-monodisperse silver nanowires solution

Gabriela Pasa Panesso¹, Cristiano Jaeger Stradolini¹, Raquel Silva Thomaz¹, Pedro Migowski¹, Adriano F. Feil¹

¹Pontifícia Universidade Católica do Rio Grande do Sul

e-mail: gabriela.panesso@acad.pucrs.br

Much effort has been devoted to the controlled synthesis of 1D nanostructures from metallic conductors, because of their potential use as interconnects or active components in fabricating nanoscale devices [1]. In this way, the purpose of this work is to achieve a reproducible and controllable synthesis of silver nanowires (Ag NWs) that will be used to prepare the transparent and conductive thin films. The synthesis of Ag NWs was performed using the polyol process, which is known as a simple method of preparation of silver nanowires by reducing silver nitrate [2]. This process also enables control over diameter and length of Ag NWs. To start the nanowires synthesis, 16 mL of ethylene glycol (EG) were added to a round-bottom flask. This flask was taken to an oil bath at a temperature of 160 °C for 60 min. After, four solutions previously prepared of NaCl, Fe(NO₃)₃, PVP and AgNO₃ were added to the flask with about 30 s between each addition. Afterwards, the flask remained on the oil bath at 160 °C for more 90 min to happen in fact the nanowire's formation. Subsequently, the system was cooled in running water, and purified by centrifugation and ultrasonic bath using acetone and ethanol. The synthesized silver nanowires were analyzed by Field Emission Scanning Electron Microscopy (FE-SEM) and their length and diameter were quantified through the obtained images. Our best results indicate that it is possible to obtain a quasi-monodisperse Ag NWs solution with 55 nm of diameter and 7.14 μm of length by adjusting the reaction conditions.

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References:

[1] Song, J. and H. Zeng, *Angewandte Chemie-International Edition*, vol. 54, (2015)

[2] Sun, Y., et al., *Chemistry of Materials*, vol. 14, 4736 (2002)