



XXXII B-MRS Meeting 2024
September 29th to October 3rd

PROCEEDINGS

The influence of halide ions in the silver nanowires synthesis using polyol method

Barbara Perez Gonçalves Silva¹, Crystian Willian Campos da Silva¹, Larissa Otubo¹

¹Instituto de Pesquisas Energéticas e Nucleares (CECTM)

e-mail: barbara_pe@hotmail.com

Silver nanowires (AgNWs) have been studied due to their great optical and electrical properties, making them potential materials to be applied in transparent conductive films (TCFs). Halide ions, such as chloride (Cl⁻) and bromide (Br⁻), have been investigated in the synthesis of AgNWs by many researchers.¹ Cl⁻ are commonly used to control the AgNWs growth by facilitating AgCl formation and controlling Ag⁺ in the solution thereby inhibiting the growth of silver particles (AgNP). Similarly, Br⁻ are also being investigated as a capping agent due to their ability to adsorb onto the (100) crystal plane of Ag, analogous to the capping agent polyvinylpyrrolidone (PVP). In this study, we investigate the influence of Br⁻ and Cl⁻ ions in the synthesis of AgNWs using the polyol method, employing ethylene glycol (EG) as solvent and reducing agent, silver nitrate (AgNO₃) as the metallic precursor and PVP as the capping agent. In the absence of halide salts, pyramids and rod structures were observed. When only Cl⁻ is added in the reaction, a mixture of pyramids rods and wires were formed. The addition of Br⁻ resulted in the formation of particles ($d=133,7 \pm 1,6$ nm) attributed to the adsorption of Br⁻ ions on the {100}, {110} and {111} crystal planes of fcc silver. The UV-vis spectrum of sample with Br⁻ exhibited a band at 430 nm, consistent with literature reports for AgNP. The spectra obtained for samples without halides and sample with Cl⁻ are consistent with larger structures. However, when both halides are introduced in the reaction, longer and thinner AgNWs were produced, as observed through SEM, AFM and UV-vis, stating their important role in the silver nanowires growth. Enhancing our comprehension on the growth process and morphological control is important for optimizing the technological application of AgNWs, especially for TCFs.

Acknowledgments: IPEN/CNEN.

References:

[1] Tang et al J Colloid Interface Sci 416, 86-94 (2014)