Systematic Analysis of Silver Interaction in $YBa_2Cu_3O_{7-\delta}$ Ceramic Nanowires

Edimar Ap. S. Duran [1], Matheus Paniago Brambilla[1] Enseio marinho da silva júnior[1] Rodolfo[1] Rafael Zadorosny *[1]

[1]São Paulo State University (UNESP), School of Engineering, Ilha Solteira, Brazil

*email: rafael.zadorosny@unesp.br

Key words: YBCO, Nanowires, Solution Blow Spinning.

This abstract will be used for both the presentation and the poster sections

The incorporation of silver (Ag) into YBCO ceramics is widely studied due to its improvements in mechanical properties such as flexural and tensile strength, crack reduction, and enhancement of superconducting properties such as critical temperature and critical current density (J_c) [1,2]. However, most research focuses on bulk materials using solid-state reaction techniques, with few approaches focusing on thin films, nanowires, and chemical routes. Recently, however, a precursor solution via a one-pot route has been developed for use in the solution blow spinning system, enabling silver insertion through a chemical route that demonstrated a reduction in phase transition temperature by approximately 30 °C [3]. Nevertheless, there is still debate regarding the effects of Ag on the ceramic structure, including composite formation, Ag localization at grain boundaries, and/or substitution of structural sites by Ag. This study focuses in two approaches: experimental and theorical. In the experimental part, nanowires synthesized by the one-pot chemical route and processed by SBS were studied for potential applications in SNSPDs. A wing-shaped collector was used to reduce average fiber diameters by about 50 nm and align them. Characterizations by XRD, Raman spectroscopy and XPS were conducted to verify the formation of ceramics and their possible phases. It was observed that high Ag concentration alters vibrational modes and causes asymmetry. In XPS, variations in layer intensities were observed while bond energy remained constant. Preliminary theoretical results suggest that van der Waals corrections in the YBCO DFT model should be considered to improve the accuracy of the lattice parameters. Studies on the interactions that form Ag in the structure are still underway.

Bibliography

[1] P. Diko, G. Fuchs, G. Krabbes, *Physica C: Superconductivity* **363**(1), 60–66 (2001).

[2] B.A. Malik, M.A. Malik, K. Asokan, *Current Applied Physics* **16**(10), 1270–1276 (2016).

[3] A.L. Pessoa *et al.*, *Ceramics International* **46**(15), 24097–24101 (2020)