Influences on Solid-State Reaction Synthesis to Obtain $CuNb_2O_6$ in Monocyclic and Orthorhombic Phases: Its Photoelectrocatalytic Performance

Luiz Henrique Dall Antonia[1], Guilherme Augusto Barros Gomes[1], Paulo Rogério Catarini da Silva[2,3], Luan Pereira Camargo[1], Julia Helena Rossieri[4]

[1]Universidade Estadual de Londrina (*Departamento de Química*) , [2]Universidade Estadual de Londrina, [3]State University of Londrina (*Departamento de Física*) , [4]Universidade Estadual de Londrina (*Departamento de Quimica*)

e-mail: LUIZH@UEL.BR

The search for new materials with photoelectrocatalytic properties has become fundamental. The light on the material allows the generation of the electron/hole pair simultaneously with the application of a potential, minimizing the recombination effect and increasing the time of charge carriers. The nature of $Cu_xNb_yO_z$copper niobate can assume two distinct categories depending on the oxidation of copper in the compound. The nature of $CuNb_2O_6$containing divalent copper ions takes in two distinct phases, monoclinic and orthorhombic [1]. This work aimed to synthesize $CuNb_2O_6$(by solid-state) under different conditions. The (photo)electrochemical properties of the material for the oxidation reaction of ascorbic acid. The X-ray diffractometry technique confirmed the formation of the semiconductor. The Rietveld refinement showed the presence of the monoclinic and orthorhombic phases in different proportions depending on the imposed conditions. The heterogeneity of the precursors promoted the formation of impurities in the samples formed. SEM and DLS confirmed the spherical morphology (0.2 to 1.0 mm). The electrodes constructed by the *drop-casting*technique exhibited a considerable anodic response in the presence of light, characterizing the material as n-type through the Mott-Schottky curves (E_g= 2.7 eV). The presence of the monoclinic phase in the prepared electrodes provided a superior photoelectrochemical response to the electrode containing the orthorhombic phase, caused by a structural difference (Jahn-Teller effect). This work contributes to how synthesis variations affect the phases formed in the samples and an initial study to understand oxidation reactions of organic species on the surface of the mixture containing copper niobate.

Acknowledgment:

CAPES, UEL, LMEM and ESPEC.

References:

[1] S. Kamimura et al. Journal of Photochemistry and Photobiology A: Chemistry.,356, 263-71 (2018).