



Radioluminescence and Photoluminescence Properties of BaZrO₃ Decaoctahedrons obtained by Microwave-Assisted Hydrothermal Method.

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Abstract – Microcrystalline BaZrO₃ powders under decaoctahedral shape were prepared by Microwave-Assisted Hydrothermal Method at 140°C for different times. A broad photoluminescence (PL) and innovative radioluminescence (RL) emissions were observed at room temperature. The phase formation, morphological evolution and RL emissions are in accordance among them. The broad PL profile is due to multiphotonic process and is less intense to samples synthesized by 10 and 20 minutes than other ones.

This work rationalized the study of visible intense photoluminescent properties and broad radioluminescent emission observed at room temperature for BaZrO₃ (BZ) nanoparticles self-assembly on microcrystalline decaoctahedral shape. BZ perovskite compounds were obtained by syntheses via Microwave-Assisted Hydrothermal method (MAH).

The experimental procedure is described as follows: 0.05 mol of (BaCl₂·2H₂O) (Aldrich) and ZrOCl₂·8H₂O (Aldrich) was dissolved in double-distilled, and were co-precipitated by KOH aqueous solutions at 6 M. The solutions were placed into a sealed polytetrafluoroethene (PTFE), Teflon[®] autoclave in a microwave oven (2.45 GHz, 800W)¹ for 10 to 160 min at 140°C reporting high superficial areas. The XRD pattern was indexes as cubic structure. Figure 1 report the photoluminescence (PL) spectra which shown a little green-shift for samples (c) 40, (d) 80 and (e) 160 min, carrying the increasing intermediary states inside of the band gap^{2,3}. The Figure 2 show the innovative radioluminescence (RL) property for perovskites compounds recorded at room temperature under X-rays excitation (CuK α) using an Ocean Optics HR2000 spectrometer equipped with an optical fiber. The RL emission reports a multiphotonic process owing to their bimodal profile. The PL emission as interpret as a signal for a highly disordered structure by distorted zirconium octahedral site which can be the main responsible for introducing changes in the symmetries⁴ of BZ samples. The PL and RL emissions seem to be related with the phase formation and decaoctahedral BaZrO₃ growth.

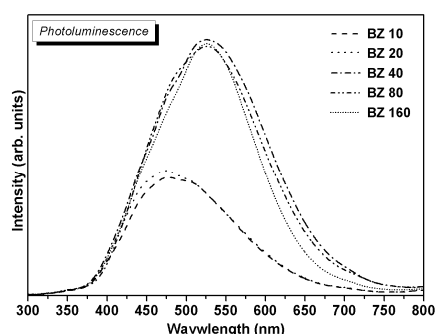


Figure 1: PL spectra of crystalline BaZrO₃ obtained by hydrothermal-microwave synthesis

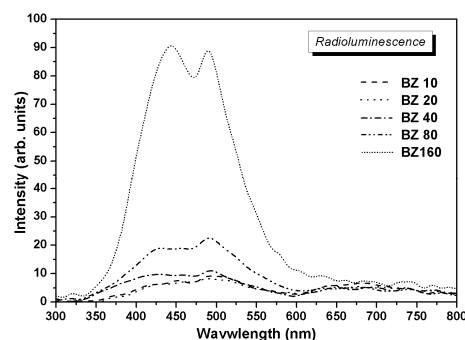


Figure 2: RL spectra of BaZrO₃ microcrystals

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Acknowledgements: FAPESP/CEPID, CNPq and CAPES.