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Photoluminescence Property of $CaZn_2(OH)_6.2H_2O$ Processed by Microwave-Hydrothermal Method

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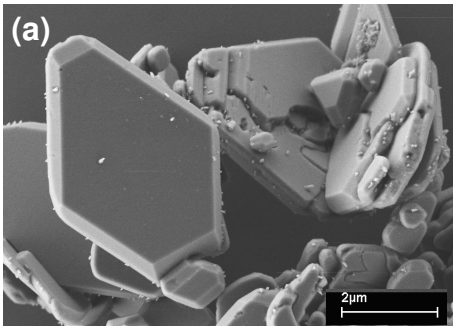
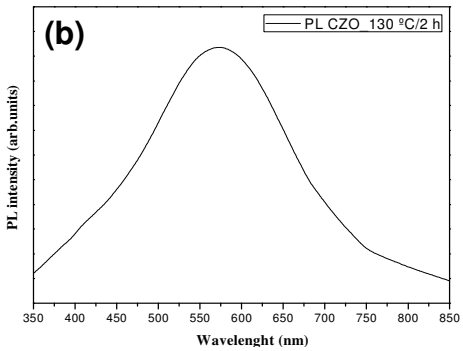
Abstract – In this work, $CaZn_2(OH)_6.2H_2O$, (CZO) powders were synthesized under microwave-hydrothermal (MH) conditions. These powders were analyzed by X-ray diffraction (XRD), Field-emission gum scanning electron microscopy (FEG-SEM), ultraviolet-visible (UV-Vis) spectroscopy and photoluminescence (PL) measurements. XRD patterns confirmed that the pure CZO phase was obtained after MH processing performed at 130 ºC for 2 h. The pure CZO powders exhibited an orange PL emission.

Calcium hexahydroxodizincate dihydrate, (CZO), is well-known in the literature as an active material for secondary Zn electrodes employed in batteries [1-3]. $CaZn_2(OH)_6.2H_2O$ compound contains in your structure Zn^{2+} cluster in tetrahedral coordination by OH^- and Ca^{2+} cluster in octahedral coordination by four OH^- and two H_2O [4]. In this work, calcium zincate powders were synthesized by microwave-assisted hydrothermal method in basic medium at 403 K for 1 and 2 h. Solutions of $Zn(NO_3)_2$, $Ca(NO_3)_2$ and KOH were mixed with constant stirring for 15 minutes, producing a white precipitate. The resulted solution was transferred into a sealed Teflon autoclave and placed in a domestic microwave. Finally, the reaction system was heat treated at 403 K for 1 and 2h. The powders were collected and washed with deionized water several times and then dried at 333K in an oven. The XRD results show that all diffraction peaks can be indexed as ($CaZn_2(OH)_6.2H_2O$) that are consistent with the respective JCPDS card Nº 87-155. In the field-emission scanning electron microscopy (FEG-SEM) images, Figures 1 (a), can be observed that pure material presents crystals irregular lozenge-like microparticles. The powder was analyzed by ultraviolet visible absorption spectroscopy (UV-vis) which was employed to determine the optical band gap of this material. Also it showed existence of orange photoluminescence (PL) emission, Figure 1 (b), in the CZO powder when excited by 350 nm wavelength at room temperature.



Figures 1 (a) FEG-SEM image of CZO powders processed in MH at 130 ºC for 2 h



Figures 2 (b) PL spectra of CZO powders processed in MH at 130 ºC for 2 h

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