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Hydrothermal Microwave synthesis of PZT 52/48 powders with addition of PVA.

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Abstract: Lead zirconium titanate (PZT) perovskite powders were synthesized by microwave hydrothermal method (M-H) at 190°C for different times (30 min, 2; 4; 8 and 12 h) with the presence of aqueous PVA solution. The X-ray diffraction, SEM-FEG, as well as measurements of photoluminescence (PL) emission were used for monitoring the formation of a perovskite phase whit random polycrystalline distortion in the structure.

PZT perovskite powders were synthesized by microwave hydrothermal method (M-H) at 190°C for different times (30min, 2; 4; 8 and 12h) with the presence of aqueous PVA solution 0,36gL^{-1}. Aqueous solution of lead nitrate [$Pb(NO_3)_2$], oxyzirconium chloride [$ZrOCl_2.8H_2O$], and titanium (IV) isopropoxide $C_{12}H_{28}O_4Ti$ were used as starting chemicals. Stoichiometric amounts of lead nitrate and oxyzirconium chloride were mixed with alcoholic solution of titanium (IV) isopropoxide and KOH aqueous solution 1.8 mol.L^{-1} was used as catalyst of the hydrothermal reaction. M-H heating was done in a microwave digestion system (CEM Corporation - MARS 5 Microwave Accelerated Reaction System). After the M-H treatments the solid and solution phase were separated by centrifugation before characterization. The X-Ray diffraction, SEM-FEG as well as measurements of photoluminescence (PL) emission were used for monitoring the formation of a perovskite phase with random polycrystalline distortion in the structure. Emission spectra, Fig 2, with fixed excitation wavelength 488 nm, showed higher valor to powder obtained with 12h of treatment. A theorical model derived from previous calculations allow us to discuss the origin of the photoluminescence emission in powders can be related to the local disorder in the network of both ZrO_6 and TiO_6 octahedral, and dodecahedral PbO_{12}. Initial observations of a novel morphology of the PZT perovskite crystal growth as fine plates Fig.3 is directly related to photoluminescence emissions in the lower energy than PZT with cubes morphology that emits in 600nm.

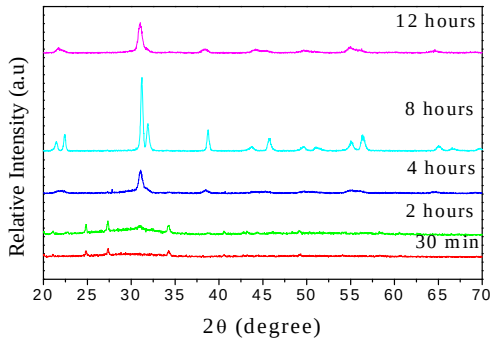

Figure 1: XRD diffraction of PZT powders synthesized from 190°C by M-H method at different times with concentration of 0.08 mol.L^{-1} and addition of aqueous PVA solution.

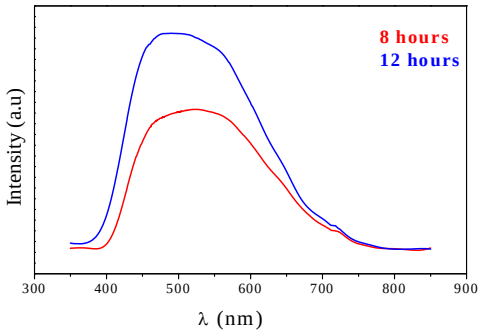

Figure 2: PL spectrum of PZT powders synthesized from 190°C by M-H method at 8 and 12 hours with concentration of 0.08 mol.L^{-1} and addition of aqueous PVA solution. Excitation wavelength 488 nm.

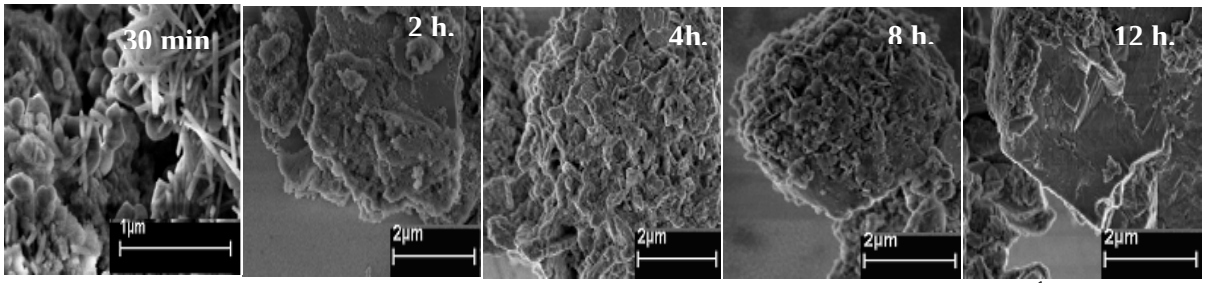

Figure 3:-SEM-FEG of PZT powders synthesized by M-H method at different times with concentration of 0.08 mol.L^{-1} and addition of aqueous PVA solution.

(1) QINGTAO PAN, JIANFENG JIA, KAI HUANG, DEYAN HE, Materials Letters,v.61 p. 1210-1213-2007