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Phase formation, Crystal Lattice and Microstructure Studies of sol-gel derived Pb(Ti,Fe)O_3[1] SOMADITYA SEN, DAVID GELTING, SHISHIR RAY, YING ZOU, DONALD ROBERTSON, MARIJA GAJDARDZISKA-JOSIFOVSKA, LARRY BUROKER, MARK WILLIAMSEN, PRASENJIT GUPTASARMA[2], Physics Dept., Univ. of Wisconsin, Milwaukee, 1900 E Kenwood Blvd. Milwaukee, WI 53211, USA — It has recently been suggested[1] that Fe-substituted $PbTiO_3$ can exhibit magnetoelectric multiferroic behavior. With an intent to examine whether Fe can fully substitute the lattice in Pb(Ti,Fe)$O_3$and to study its effect on crystal structure, we have synthesized highly phase pure nanopowders from citric acid metal ion chelate complexes stabilized by glycerol in a sol gel. Using variety of probes, we demonstrate that Fe can substitute Ti up to at least 0.5 atoms per formula unit of Pb(Ti,Fe)O_3. Rietveld refinement of XRD data, from both laboratory and synchrotron sources, demonstrates that crystal structure of Fe substituted phases can be derived from the parent orthorhombic $PbTiO_3$ phase. Increasing concentration of Fe up to x=0.3 results in drastic change in lattice parameters and decrease in orthorhombic distortion. These results are supported by detailed studies of XRD, TEM and XAFS.

[1] Palkar et al, Appl. Phys. Lett. 90(2007)172901.

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