Poster Presentation

MS01.P12

Study of A New Antiferro-/Ferro-electric Solid Solution: PbZrO3-Pb(Zn½W½)O3

S. Huo[1], N. Zhang[1], Z. Ren[1], H. Wu[1,2], Z. Ye[1]

[1]Department of Chemistry and 4D LABS, Simon Fraser University, Burnaby, BC, Canada, [2]Donghua University, Department of Applied Physics, Shanghai, P. R. China

PbZrO3 (PZ) is the most widely used antiferroelectric material in the world. There is a possible intermediate ferroelectric (FE) phase between the room-temperature antiferroelectric (AFE) phase and the high-temperature paraelectric (PE) phase. However, the intermediate phase is difficult to be directly observed. Even though the FE phase is suggested to be rhombohedral, the space group which it belongs to is still uncertain. Therefore, Pb(Zn½W½)O3 was chosen to modify PZ. A new antiferroelectric solid solution of (1-x)PbZrO3-xPb(Zn½W½)O3 (PZ-xPZnW, with x=0-10%) has been prepared in the form of ceramics by solid state reaction method. The crystal structure and properties have been investigated. The X-ray powder diffraction (XRD) reveals a pure perovskite phase, indicating the formation of the PZ-PZnW solid solution. Crystal structural refinements reveal that the substitution of PZnW in PZ does not change the crystal symmetry. The dielectric measurements demonstrate a decrease in Curie temperature (TC) from 228 ºC to 195 ºC with higher concentration of PZnW from 0% to 8%. Also, a transition between the AFE phase and the intermediate phase was observed and its transition temperauture (TAFE-FE) decreases more significantly than TC. The temperature range for the intermediate phase is enlarged as a result. Typical ferroelectric hysteresis loop was observed in PZ-3%PZnW above TAFE-FE, which confirms the ferroelectric nature for the intermediate phase. Based on the analysis of the temperature-variable XRD patterns, the antiferroelectric phase is orthorhombic of space group Pbam while the intermediate ferroelectric phase is rhombohedral of space group R3m. Above TC, the crystal structure is cubic phase belong to space group Pm-3m

[1] *B.A. Scott and G. Burns, J. Am. Chem. Soc., 1972, 55, 331-333,* ***[2]*** *D.L. Corker et al, Acta Cryst., B53, 135-142, 1997,* ***[3]*** *G. Shirane, et al, Phys. Rev., 84(3), 476-481, 1951*

Keywords: ceramics, antiferroelectric, ferroelectric