Structure development and dielectric properties of (1-x)$Pb(Ni_{1/3}Ta_{2/3})O_3$-x$PbTiO_3$ ceramics

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Lead-based relaxor ferroelectrics are being used as capacitors, transducers, and memory devices. Much of the research has been carried out on lead-based niobate $Pb(B_{1-x}Nb_x)O_3$, (B=Zn^{2+}, Mg^{2+}, Ni^{2+}) and on the solid solution between $Pb(B_{1-x}Nb_x)O_3$ and $PbTiO_3$. Lead-based tantalate $Pb(B_{1-x}Ta_x)O_3$ is another family of lead-based relaxor ferroelectrics. But not too much attention has been paid to this material system. The low phase transition temperature of some members of $Pb(B_{1-x}Ta_x)O_3$, in which B is Zn^{2+}, Mg^{2+}, Ni^{2+}, make them important candidates for utilization in devices operating at cryogenic conditions, like capacitors and actuators for space application. In this paper (1-x)$Pb(Ni_{1/3}Ta_{2/3})O_3$-x$PbTiO_3$ (x=0.00~0.80) ceramics were prepared by conventional method. The phase structure development was investigated by XRD analysis. The perovskite phase can not be obtained when x=0.00. As the PT content increases, the content of the perovskite phase increases. When x>0.40, the pure perovskite phase is obtained. The temperature and frequency dependence of the dielectric properties is measured. The relationship between phase structure and dielectric properties is discussed.