CRYSTAL STRUCTURE AND DIELECTRIC PROPERTIES OF THE MIXED-LAYER AURIVILLIUS PHASES $Bi_7Ti_{4+x}W_xNb_{1-2x}O_{21}$ (x= 0.1, 0.2, 0.3, 0.4, 0.5)

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Ferroelectric materials on the base of layered bismuth oxides have been extensively studied in view of their applications in nonvolatile computer memories and high-temperature piezoelectric transducers. Among bismuth layered-structured compounds, most of members have the Aurivillius phase (APs) type of the crystal structure. The general chemical formula for APs is $Bi_2A_{m-1}B_mO_{3m+3}$, where the A site can be occupied by large cations such as Bi^{3+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Pb^{2+}, Na^+, K^+, Th^{4+} or rare earth ions and the B site by highly charged small cations such as Ti^{4+}, Nb^{5+}, Ta^{5+}, W^{6+}, Mo^{6+}, Fe^{3+}, Mn^{4+}, Cr^{3+}, Ga^{3+}, *ets*. The crystal structure of all APs consist of perovskite-like $[A_{m-1}B_mO_{3m+1}]^{2-}$ units which are regularly interleaved with $[Bi_2O_2]^{2+}$ layers. The integer *m* =1-5 corresponds to the number of oxygen octahedra layers in the perovskite-like slabs. Besides these simple members of APs, the mixed-layer APs intergrowths (*m* =1+2, 2+3 and *ets*) have been prepared as pure phases. In this work pure polycrystalline $Bi_7Ti_{4+x}W_xNb_{1-2x}O_{21}$ (x= 0.1, 0.2, 0.3, 0.4, 0.5) ceramics (*m* = 2+3) with APs structure were prepared by traditional solid state reaction. The crystal structures of APs $Bi_7Ti_{4+x}W_xNb_{1-2x}O_{21}$ (x= 0.1, 0.2, 0.3, 0.4, 0.5) have been analyzed by powder X-ray diffraction. All these APs have been refined in orthorhombic space group *I2cm* (46), with *a*= 5.4114 Å, *b*=5.4449 Å, *c*=58.0131 Å ($Bi_7Ti_4NbO_{21}$), *a*=5.3995 Å, *b*=5.4338 Å, *c*=57.9060 Å ($Bi_7Ti_{4.1}W_{0.1}Nb_{0.8}O_{21}$), *a*=5.3977 Å, *b*=5.4321 Å, *c*=57.8444 Å ($Bi_7Ti_{4.2}W_{0.2}Nb_{0.6}O_{21}$), *a*=5.3921 Å, *b*=5.4204 Å, *c*=57.7603 Å ($Bi_7Ti_{4.3}W_{0.3}Nb_{0.4}O_{21}$), *a*=5.4013 Å, *b*=5.4040 Å, *c*=57.6529 Å ($Bi_7Ti_{4.4}W_{0.4}Nb_{0.2}O_{21}$), *a*=5.4106 Å, *b*=5.3877 Å, *c*=57.5455 Å ($Bi_7Ti_{4.5}W_{0.5}O_{21}$).

The dielectric properties of APs were investigated in the frequency range of 25Hz- 1MHz and the temperature range of 25^0C- 900^0C. In each case, a double anomaly in temperature dependence of dielectric permittivity was found. The temperatures of the anomaly correspond to ferroelectric-ferroelectric and ferroelectric-paraelectric phase transitions. The Curie temperatures t_c for APs $Bi_7Ti_{4+x}W_xNb_{1-2x}O_{21}$ are dependent on parameter *x* (t_c=849^{0}C at *x*=0, t_c=826^{0}C at *x*=0.1, t_c=786^{0}C at *x*=0.2, t_c=760^{0}C at *x*=0.3, t_c=742^{0}C at *x*=0.4 and t_c=712^{0}C at *x*=0.5). The activation energies E_a for charge carriers in APs calculated using the dependence of conductivity vs. 1/T were obtained to vary from 1.26 to 1,74 eV at high temperature (> 400^0C).