Effect of $Pb(Zr_xTi_{1-x})O_3$ Composition on Crystallographic Texture in PZT Composites

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The factors determining the texture development in $Pb(Zr_xTi_{1-x})O_3$ matrix on platelike $Ba_6Ti_{17}O_{40}$ grains was studied by examining the effect of matrix composition on the texture development. Platelike $Ba_6Ti_{17}O_{40}$ particles (B6T17) were prepared by molten salt synthesis using NaCl-flux. Matrix $Pb(Zr_{1-x}Ti_x)O_3$ (PZT-x) particles (x=0, 0.3, 0.5, 0.7, and 1) were prepared by a conventional method. The slurries containing PZT-x, B6T17, and excess PbO were tape-cast by a doctor blade technique. The green compacts were prepared by lamination of tape-cast sheets and sintered at various temperatures between 900^o and 1250^oC. The crystalline phases and microstructures were different depending on the PZT composition (x value). For the case of Ti-rich PZT (x=0~0.5), texture development occurred with the most intense (111) peak and template grains maintained their platelike shape at sintered temperatures. However, for the case of Zr-rich PZT (x=0~0.3), platelike templates disappeared and the specimens had a XRD pattern similar to that of untextured specimen. The template grains embedded in the Zr-rich matrix disappeared by reaction between template and matrix at sintering temperature. The presence and absence of templates result in the different course of texture development. In addition, the growth rate of PZT layer on the template grains is large in the specimens with Ti-rich PZT. Thus, the Zr concentration in PZT is an important factor for the development of crystallographic texture.