



Mechanism of $ZrTiO_4$ Synthesis by Mechanochemical Processing of TiO_2 and ZrO_2

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Abstract

High-energy ball milling initiates a solid-state reaction in an equimolar mixture of TiO_2 and ZrO_2 . The first stage of ball milling induced the transformation of anatase TiO_2 to high-pressure phase TiO_2 (II), isostructural with $ZrTiO_4$. The formation of solid solutions monoclinic ZrO_2/TiO_2 and TiO_2 (II)/ ZrO_2 was observed in the intermediate stage. Afterward, a nanosized $ZrTiO_4$ phase was formed in the milled product from the TiO_2 (II)/ ZrO_2 solid solution. The sintering of the milled product at a temperature $<1100^\circ\text{C}$ was examined *in situ* by Raman spectroscopy. The full solid-state reaction toward $ZrTiO_4$ ceramic is completed at a temperature considerably lower than reported in the literature.

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