# Stability of Tetragonal Zirconia in Molten Fluoride Salts

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*The phase stability of tetragonal zirconia specimens in various molten salts was studied by a corrosion test. The corrosion test was examined using 3 mol% $Y_2O_3$-partially stabilized $ZrO_2$ (3 Y-PSZ) with high thermal phase stability. XRD results indicated that the phase transformation of 3 Y-PSZ from tetragonal (t) to monoclinic (m) phase (t→m transformation) was observed only in molten fluoride salts. When 3 Y-PSZ was dipped into molten $Na_2SiF_6$ salt, more than 90% tetragonal phase on the surface of 3 Y-PSZ transformed into monoclinic one in 5 min-dipping. The corrosion depth accompanied by the t→m transformation reached 300 μm for 200 min-dipping. From the results of corrosion tests with alkaline metal fluorides, the rate of t→m transformation on the surface of a sintered body and the rate of depth increase from surface to inside depended on the ionic radius of univalent cations. In the same test with $PbF_2$, the sintered body was heavily attacked, but no remarkable t→m transformation was observed on the surface of the sintered body. Raman spectra for the surface of test samples gave dispersed bands characteristic of the tetragonal phase. The result indicated that Pb restrains tetragonal particles. The corrosion depth for 3 Y-PSZ-$Al_2O_3$ was the same as that for 3 Y-PSZ. EPMA results indicated that the region enriched with Si or Na was equivalent to the t→m transformation range over 90% by XRD analysis. Remarkable t→m transformation is considered to be influenced by these cations. The activation energy was measured to estimate the t→m transformation rate. The activation energies of 3 Y-PSZ, 3 Y-PSZ-$Al_2O_3$ and 3 Y-PSZ-$Cr_2O_3$ were 12, 44 and 154 kJ/mol, respectively. The t→m transformation depth of 3 Y-PSZ-$Cr_2O_3$ was the smallest among the three 3 Y-PSZ complexes. 3 Y-PSZ-$Cr_2O_3$ had high phase stability in molten fluoride salts.*

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# Thermal and Mechanical Properties of Aluminumtitanate-Mullite Composites (Part 1)

## Effects of Composition

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*The thermal expansion, thermal stability and bending strength of aluminumtitanate (AT)-mullite composites prepared from synthesized AT, Newzealand kaolin and aluminum hydroxide were investigated. The results obtained are summarized as follows ; (1) The average linear thermal expansion coefficient from 100° to 1100°C increased slightly with increasing amount of AT up to 50 wt%, and decreased with further increase in the amount of AT, approaching to the value of fired AT. The average linear thermal expansion coefficients from 1100° to 1400°C in heating and from 1400°C to the turning point in the cooling stage increased monotonously with increasing AT content. (2) The degree of thermal expansion hysteresis decreased with decreasing amount of AT. (3) The bending strength of the composites containing 10-30 wt% AT was the highest, and decreased with further increase in the amount of AT. (4) The decomposition of AT in the composites was restrained almost completely.*

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