

Nanocomposites and nanomaterials

Solubility of chromium in tetragonal and cubic zirconia

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Solubility of reinforcing additive in matrix compound is among principal factors governing microstructure and mechanical properties of a composite. Despite enhanced mechanical properties [Bannister 1993; Hirano 1996] zirconia/chromia system has not gained much attention because of high chromium volatilization at elevated temperatures [Ownby 1972]. However, volatilization of chromium appears to become negligible when starting powder size falls in to nano-region.

Available estimates of chromium solubility in yttrium-stabilized zirconia based on lattice data vary significantly depending on yttria load. Jayaratna et. al have estimated chromium solubility to be 1.4 and 0.7 mol. % of chromia for cubic zirconia containing 14.8 and 8 mol. % of yttria [Jayaratna 1984; Jayaratna 1986]. In tetragonal zirconia stabilized with 3 mol. % of yttria solubility was found to be approx. 0.33 mol. %, but available experimental data point on even lower solubility.

Present paper concerns chromium solubility in tetragonal and cubic zirconia. Dependence of solubility on yttria content is discussed.

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