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# **A review of an innovative concept to increase the toughness of the ceramics by piezoelectric secondary phases**

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## **Abstract**

Despite of wide range scope of ceramics for various applications, such as healthcare, space, and energy storage etc., poor fracture toughness restricts their multifunctional performance. The development of various techniques/approaches to improve the fracture toughness of ceramics is in continuum thrust. The present work reviews one of the novel techniques to enhance the toughness of ceramics with the incorporation of piezoelectric secondary phase in the matrix. In addition to the piezoelectricity induced toughening mechanisms such as, energy dissipation due to electro-mechanical phenomenon as well as stress-induced domain switching toughening, other toughening mechanisms such as, transformation toughening, crack bridging, crack deflection and microcrack toughening also contributes to the total observed toughening of piezo-composites. As far as the piezoelectricity induced toughening is concerned, the poling direction and electrical field parameters also affect the toughness of the ceramics.

**Keywords:** Toughening mechanism, Piezoelectricity, Domain switching.

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