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Stress-Focusing Effect in a Spherical Zirconia Inclusion with Dynamically Transforming Strains

Toshiaki Hata

Faculty of Education, Shizuoka University, Shizuoka, Japan

Some composite materials, such as Zirconia toughened ceramics, are remarkable material, which has a high strength, a high elastic modulus, and an improved toughness, etc. These good qualities are made possible through the stress-induced phase transformation of composite particles, which is accompanied by a volumetric expansion. When a spherical inclusion in infinite elastic domain is suddenly subjected to an instantaneous phase transformation, stress waves occur at the surface of spherical inclusion the moment instantaneous transformation strains are applied. The wave may accumulate at the center and show the stress-focusing effects, even though the initial stress should be relatively small. This paper analyzes the stress-focusing effect caused by the instantaneous phase transformation in the spherical Zirconia inclusion. By using the ray theory, the numerical results give a clear indication of the mechanism of stress-focusing effect in an inclusion embedded in the infinite elastic medium.

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