

Green Function and Eshelby Tensor Based on Mindlin's 2nd Gradient Model: An Explicit Study of Spherical Inclusion Case

Authors : A. Selmi, A. Bisharat

Abstract : Using Fourier transform and based on the Mindlin's 2nd gradient model that involves two length scale parameters, the Green's function, the Eshelby tensor, and the Eshelby-like tensor for a spherical inclusion are derived. It is proved that the Eshelby tensor consists of two parts; the classical Eshelby tensor and a gradient part including the length scale parameters which enable the interpretation of the size effect. When the strain gradient is not taken into account, the obtained Green's function and Eshelby tensor reduce to its analogue based on the classical elasticity. The Eshelby tensor in and outside the inclusion, the volume average of the gradient part and the Eshelby-like tensor are explicitly obtained. Unlike the classical Eshelby tensor, the results show that the components of the new Eshelby tensor vary with the position and the inclusion dimensions. It is demonstrated that the contribution of the gradient part should not be neglected.

Keywords : Eshelby tensor, Eshelby-like tensor, Green's function, Mindlin's 2nd gradient model, spherical inclusion

Conference Title : ICCMMS 2018 : International Conference on Composite Materials, Mechanics and Structures

Conference Location : Vancouver, Canada

Conference Dates : August 09-10, 2018