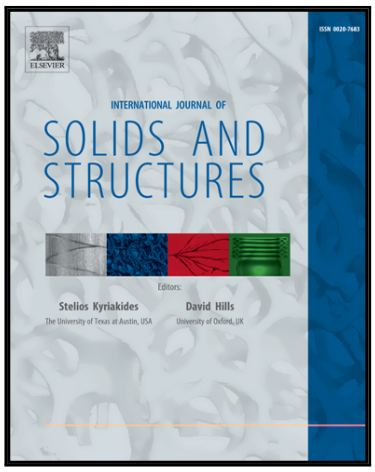

Electroelastic ellipsoidal inclusion with imperfect interface and its application to piezoelectric composite materials

F. Dinzart , H. Sabar

PII: S0020-7683(17)30553-X
DOI: 10.1016/j.ijsolstr.2017.12.017
Reference: SAS 9835

To appear in: *International Journal of Solids and Structures*

Received date: 19 January 2017
Revised date: 11 November 2017
Accepted date: 12 December 2017

Please cite this article as: F. Dinzart , H. Sabar , Electroelastic ellipsoidal inclusion with imperfect interface and its application to piezoelectric composite materials, *International Journal of Solids and Structures* (2017), doi: 10.1016/j.ijsolstr.2017.12.017

Electroelastic ellipsoidal inclusion with imperfect interface and its application to piezoelectric composite materials

F. Dinzart * **and H. Sabar**

Laboratoire d'Etude des Microstructures et de Mécanique des Matériaux

Ecole Nationale d'Ingénieurs de Metz

1 Route d'Ars Laquenexy 57078 Metz Cedex 03 France

Abstract

In this work, a new micromechanical model is presented to determine the effective behavior of piezoelectric composite materials with ellipsoidal reinforcements and imperfect interfaces. The integral equation is obtained by the Green's function technique applied to the electroelastic heterogeneous problem. This integral equation is further solved in the case of an ellipsoidal inclusion embedded in an infinite matrix with imperfect interface. By introducing the concept of interior and exterior-point Eshelby tensors, the solution of the inclusion problem is given in the case of displacement and electric fields discontinuities across the interface between inclusion and matrix. The concentration equation is expressed in anisotropic electroelasticity for ellipsoidal inclusions with imperfect interface. This equation is exact in the case of linear spring interface model for spherical and cylindrical inclusions. We compare the concentration tensors to the results given by exact model for cylindrical inclusion and in-plane loading. The Mori-Tanaka homogenization scheme is used to determine the effective electroelastic moduli of piezoelectric composite materials. In the case of spherical and cylindrical inclusions, the effective electroelastic moduli are compared to other models and experimental results. The combined influence of shape of inclusions and interface parameters is analyzed on the effective electroelastic behavior.

* corresponding author : E-mail address : florence.dinzart@univ-lorraine.fr