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## Comments on

**Title:** Micromechanical characterization of composites with imperfect contact conditions at the interface (Caracterización micromecánica de compuestos con condiciones de contacto imperfecto en la interfase)

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## **Comments:**

Piezoelectric composite materials have been widely used in various industry areas. This thesis studies the mechanical-electrical behaviors of periodic piezoelectric composite materials with mechanical and electric imperfect interfaces. The main contribution of the present thesis includes: The Asymptotic Homogenization Method (AHM) with two scales is developed for deriving the local problems which are solved by using the method of complex variables. The analytical expressions of the effective coefficients considering mechanical and electric imperfect interfaces between the constituents of the composite are obtained. Computational programs for obtaining numeric results were written and comparisons with theoretical and experimental models are present. The numerical results show that

- 1) Composites with different arrangement of the cells (parallelogram or rectangular) periodic cells exhibit more general anisotropic behavior than those with square or hexagonal periodic cells.
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- 2) The mechanical and electric imperfect interfaces have an effect on the performance of the composites. The mechanical imperfect parameter affects the elastic and piezoelectric effective coefficients in both in-plane and out-of-plane problems, whereas the electric imperfect parameter only influences the piezoelectric and dielectric coefficients for out-of-plane problems.
- 3) As a particular case, the results derived by other authors for periodic squares and hexagonal cells can be obtained from the expressions. In the limiting case when the imperfect mechanical and electric parameters approach to the infinity, the results for the perfect interface condition can be yielded.

The research of the present thesis is relevant to understanding of the mechanical-electrical behaviors of periodic piezoelectric composite materials and is of significance in practical applications. The thesis is very well written.

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