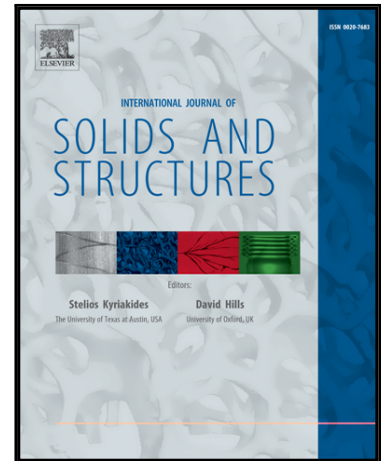


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Homogenization of porous piezoelectric materials

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Abstract

This paper presents a homogenization study of porous piezoelectric materials through analytical and numerical analysis. Using two of the most well-known analytical methods for theoretical homogenization, the Mori-Tanaka and self-consistent schemes, the full set of material properties are obtained. These results are compared to two different theoretical bounds, the Halpin-Tsai and Hashin-Shtrikman bounds. A numerical model of a representative volume element is then developed using finite element analysis for different percentages of inclusions. Finally, the analytical and numerical results are compared and discussed; a good agreement between the analytical and numerical methods is shown.

Keywords: Piezoelectricity, Porous, Homogenization, Numerical, Mori-Tanaka, Finite Element Method

1. Introduction

The piezoelectrical effect is the capacity exhibited by some materials to convert strain to electrical energy and electrical energy to strain. Piezoelectric materials have

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