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Sensitivity and uncertainty analysis for flexoelectric nanostructures

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Abstract

In this paper, sensitivity analysis has been applied to identify the key input parameters influencing the energy conversion factor (ECF) of flexoelectric materials. The governing equations of flexoelectricity are modelled by a NURBS-based IGA formulation exploiting their higher order continuity and hence avoiding a complex mixed formulation. The examined input parameters include model and material properties and the sampling has been obtained using the latin hypercube sampling (LHS) method in the probability space. The sensitivity of the model output to each of the input parameters at different aspect ratios of the beam is quantified by three various common methods, i.e. Morris One-At-a-Time (MOAT), PCE-Sobol', and Extended fourier amplitude sensitivity test (EFAST). The numerical results indicate that the flexoelectric constants are the most dominant factors influencing the uncertainties in the energy conversion factor, in particular the transversal flexoelectric coefficient (h_{12}). Moreover, the model parameters also show considerable inte-

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