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Energy minimizers for an asymptotic MEMS model with heterogeneous dielectric properties. (English) [Zbl 07451521]

Summary: A model for a MEMS device, consisting of a fixed bottom plate and an elastic plate, is studied. It was derived in a previous work as a reinforced limit when the thickness of the insulating layer covering the bottom plate tends to zero. This asymptotic model inherits the dielectric properties of the insulating layer. It involves the electrostatic potential in the device and the deformation of the elastic plate defining the geometry of the device. The electrostatic potential is given by an elliptic equation with mixed boundary conditions in the possibly non-Lipschitz region between the two plates. The deformation of the elastic plate is supposed to be a critical point of an energy functional which, in turn, depends on the electrostatic potential due to the force exerted by the latter on the elastic plate. The energy functional is shown to have a minimizer giving the geometry of the device. Moreover, the corresponding Euler-Lagrange equation is computed and the maximal regularity of the electrostatic potential is established.

MSC:
35J50 Variational methods for elliptic systems
49Q10 Optimization of shapes other than minimal surfaces
49J40 Variational inequalities
35R35 Free boundary problems for PDEs
35Q74 PDEs in connection with mechanics of deformable solids

Full Text: DOI

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