SM19S_11711

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Asymptotic Behavior of Piezoelectric Plates

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We extend to the linearly piezoelectric case the mathematical derivation of the linearly elastic behavior of a plate as the limit behavior of a three-dimensional solid whose thickness 2e tends to zero. Due to classical assumptions on the exterior loadings, a suitable scaling is defined by to study the limit behavior as e goes to 0. Note that the assumptions on the forces are those which provide Kirchhoff-Love limit plate theory while those on the electrical loading involve an index p running over 1, 2 that will imply two kinds of limit models according to the nature and the magnitude of the data. We show that the scaled states converge in a suitable topology to the unique solution of the limit problem indexed by p. These limit problems (p = 1 or 2) are connected with the physical situations where the thin plate acts as an actuator or a sensor.

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