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**Nonlinear vibration of piezoelectric sandwich nanoplate with a functionally graded porous core with consideration of flexoelectric effect**

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**Abstract:** The porous materials become a new class of advanced engineering material due to their excellent advantage such as low specific weight, efficient capacity of energy dissipation, reduced thermal and electrical conductivity, enhanced recyclability and machinability. In this study, the nonlinear vibration of piezoelectric sandwich nanoplates with a functionally graded (FG) porous core under electrical load is presented. The piezoelectric effect, flexoelectric effect and von Karman type large deformation are simultaneously taken into account. Results show that the piezoelectric and flexoelectric effects of the material reduce the vibration frequency of the sandwich nanoplate even there is no applied voltage on the piezoelectric layer. The natural frequency of the sandwich structure with porous core can be adjusted by controlling the porosity distribution and porous coefficients of the porous material, and the applied voltages on the piezoelectric layer.

**Keywords:** Sandwich plates; functionally graded material; porous nanocomposite; piezoelectric materials; flexoelectric effect; nonlinear vibration

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