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A Study on the Effect of Piezoelectric Nonlinearity on the Bending Behaviour of Smart Laminated Composite Beam

[Akhlaq, Adnan^a](#); [Shaik Dawood, Mohd Sultan Ibrahim^a](#) ; [Jaffar Syed, Mohamed Ali^a](#) ;[Sulaeman, Erwin^b](#) [Save all to author list](#)^a Department of Mechanical and Aerospace Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Kuala Lumpur, 53100, Malaysia^b Department of Mechanical and Aerospace Engineering, College of Engineering, United Arab Emirates University, P.O. Box 15551, Al-Ain, United Arab Emirates[View PDF](#) [Full text options](#) [Export](#) **Abstract**[Author keywords](#)[Indexed keywords](#)[SciVal Topics](#)[Metrics](#)[Funding details](#)**Cited by 0 documents**

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Electric field-induced nonlinear behavior of lead zirconate titanate piezoceramic actuators in bending mode

Sumit, Kane, S.R., Sinha, A.K. (2022) *Mechanics of Advanced Materials and Structures*

Performance improvement of a piezoelectric bimorph actuator by tailoring geometry

Chattaraj, N., Ganguli, R. (2018) *Mechanics of Advanced Materials and Structures*

Static and dynamic FE analysis of piezolaminated composite shells considering electric field nonlinearity under thermo-electro-mechanical loads

Rao, M.N., Schmidt, R., Schröder, K.U. (2018) *Acta Mechanica*[View all related documents based on references](#)

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Abstract

This paper presents a finite element analysis to model and analyze composite laminated beams with distributed piezoelectric actuators attached to the top and bottom surfaces considering nonlinear constitutive equations under a high electric field. The static response is presented for piezoelectric composite laminated beam using higher order electric field nonlinearity to assess the effect of electrostriction and elastostriction coefficient at a high electric field. A finite element approach based on higher-order shear deformation theory is applied for static analysis of composite laminated beams, varying the thickness and orientation of laminates, to verify the nonlinear effect under a high electric field. A good comparison of results is shown with the available results in the literature. The finding of the results highlights the importance of considering elastostriction term along with the electrostriction term in determining the deflection and stresses of the composite laminated beam. © 2023 by the authors.


Author keywords

composite beam; elastostriction; electrostriction; piezoelectric

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🔍 Shaik Dawood, M.S.I.; Department of Mechanical and Aerospace Engineering,
Kulliyah of Engineering, International Islamic University Malaysia, Kuala Lumpur,
Malaysia; email:sultan@iium.edu.my

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