Kumar, Amritesh; **Arockiarajan, A.**

Modeling of resonant magnetoelectric response in press-fit embedded ring composite. (English) Zbl 1476.74035

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Summary: Magnetoelectric (ME) effect is a product property arising out of the interactions between the piezoelectric and the magnetostrictive phase. Multi-phase ME composites being multifunctional materials find use in myriad of applications. In this work, epoxy free two phase and three phase embedded ring ME composites have been fabricated by the press-fit technique. For a comparative study, three phase conventional epoxy bonded ring shaped composite of same dimensions have also been fabricated. Dynamic ME experiment has been conducted at room and elevated temperatures on all the prepared composites. It is shown that the epoxy free composite by virtue of the absence of epoxy shows a better resonant ME response at all temperatures. The significance of the Electromechanical Resonance (EMR) in the resonance behavior of the composites has also been highlighted. An analytical model in cylindrical coordinate system incorporating the temperature effects on the individual composite constituents and their interface coupling has been developed based on the concentric ring approach to predict the dynamic ME behavior of the epoxy free ring composite at different temperatures. The model has been further used to study the effect of volume fraction of the constituents on the ME response.

MSC:

74F15 Electromagnetic effects in solid mechanics
74E30 Composite and mixture properties
74F05 Thermal effects in solid mechanics
74H45 Vibrations in dynamical problems in solid mechanics
74-05 Experimental work for problems pertaining to mechanics of deformable solids

Keywords:

analytical modeling; three-phase epoxy composite; temperature effect; electromechanical resonance; experimental verification

Full Text: DOI

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