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Screw dislocations in piezoelectric laminates with four or more phases. (English)

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Summary: We present an analytical solution to the problem of a screw dislocation in a four-phase piezoelectric laminate composed of two piezoelectric layers of equal thickness sandwiched between two semi-infinite piezoelectric media. A new version of the complex variable formulation is proposed such that the 2×2 real symmetric matrix appearing in the formulation becomes dimensionless. Using analytic continuation, the original boundary value problem is reduced to the identification of a single 2D analytic vector function which is completely determined following rigorous solution of the resulting linear recurrence relations in matrix form. An explicit expression for the image force acting on the piezoelectric screw dislocation is obtained once the single 2×2 real matrix function is identified. We also discuss the solution for a screw dislocation in an N -phase piezoelectric laminate composed of $N - 2$ piezoelectric layers of equal thickness sandwiched between two semi-infinite piezoelectric media.

MSC:

74E30 Composite and mixture properties

74F15 Electromagnetic effects in solid mechanics

Keywords:

four-phase piezoelectric laminate; screw dislocation; analytical solution; analytic continuation; recurrence relations of matrix form

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