عنوان مقاله:

Elastoplastic torsion of hollow FGM circular shaft

محل انتشار:

تعداد صفحات اصل مقاله: 16

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خلاصه مقاله:

In many cases, a torsional shaft may be a thick-walled radially inhomogeneous cylindrical object. The hollow shafts made of functionally graded materials (FGMs) are such kind of compositions which were studied in this paper. Cylindrical FGshafts are composed of ceramic and metallic parts with power function distribution across the radial direction. The ceramic phase is isotropic elastic and the metallic phase was elastic-plastic. In this paper, the volume fraction-based elastic–plastic mixture rule of renowned Tamura–Tomota–Ozawa (TTO) was used to model the behavior of the composite material. The elasto-plastic torsion problem was modeledand solved analytically. The results were compared with the simulations of ABAQUS and the accuracy of the solutions was evaluated. Depending on the thickness and level of inhomogeneity, different modes of yielding were obtained.The results showed that plastic zone could occur at the inner or outer surfaces or simultaneously at both surfaces; even it may start in-between the thickness. Moreover, the influence of material inhomogeneity and thickness of shaft upon the plastic zone development were studied and discussed.

کلمات کلیدی:

Functionally graded material, Elastic-plastic analysis, Torsion, Hollow circular shaft, Tamura–Tomota–Ozawa model

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