

Dynamic Response of Doubly Curved Composite Shell with Embedded Shape Memory Alloys Wires

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Abstract : In this paper, dynamic response of thin smart composite panel subjected to low-velocity transverse impact is investigated. Shape memory wires are used to reinforced curved composite panel in a smart way. One-dimensional thermodynamic constitutive model by Liang and Rogers is used for estimating the structural recovery stress. The two degrees-of-freedom mass-spring model is used for evaluation of the contact force between the curved composite panel and the impactor. This work is benefited from the Hertzian linear contact model which is linearized for the impact analysis of curved composite panel. The governing equations of curved panel are provided by first-order shear theory and solved by Fourier series related to simply supported boundary condition. For this purpose, the equation of doubly curved panel motion included the uniform in-plane forces is obtained. By the present analysis, the curved panel behavior under low-velocity impact, and also the effect of the impact parameters, the shape memory wire and the curved panel dimensions are studied.

Keywords : doubly curved shell, SMA wire, impact response, smart material, shape memory alloy

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