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Comparing the Effect of Geometry on the Stress-Strain Response of Isolated Corrugation Structures and Corrugation Reinforced Composite Structures

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Abstract

The use of a corrugated geometry can improve necking strain without sacrificing strength when compared to similar structures with a straight geometry. In this work, Finite Element Modeling (FEM) simulations were performed exploring how the presence of a matrix material in a composite impacts the ability of the corrugated structure to improve the necking strain when compared to isolated corrugations with the same geometry. It was found that unlike for isolated corrugations, the degree of corrugation present in a corrugation reinforced composite must exceed a threshold value in order to overcome the improvement in ductility caused by the presence of the matrix. In addition it was shown that it is the unbending of the corrugation that leads to a boost in work hardening which ultimately postpones necking.

Keywords

corrugated structures; finite element modeling (FEM); composite materials; necking strain.

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