

عنوان مقاله:

Design, Optimization and Manufacturing of a Novel Corrugated Composite for Morphing Applications

محل انتشار:

دومین همایش ملی مکانیک محاسباتی و تجربی (سال: 1398)

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خلاصه مقاله:

In this study, a morphing airfoil consisting of corrugated composite core and Shape Memory Alloy (SMA) wire has been designed and optimized. For that reason, at first different corrugated GFRP composite structures having various shapes, pitch and thickness were designed and optimized to have morphing angle of 20 degrees, the lowest weight and maximum vertical displacement at the free end using the Responsive Surface Method (RSM). The analysis was done using the Abaqus software. In the next step the optimum corrugated GFRP composite structures determined by the RSM method in Design-Expert software was modeled in Abaqus. The optimum sample was then manufactured using a Foam mold and hand layup process. A nitinol SMA wire was used to actuate the manufactured corrugated structure. Finally the performance of the optimum model and manufactured sample was compared. The results showed that the triangular corrugated shape with 33.3 mm pitch and 0.48 mm thickness is the optimum sample having the minimum weight of 6.98 grams and maximum vertical displacement at the free end of 26.82 mm with morphing angle of 20 degrees. Comparing the displacement at the end of the numerical model and the manufactured sample shows a negligible difference of 1.42% showing a promising model to be used for further investigations in this area of research.

کلمات کلیدی:

Corrugated composite, Morphing airfoil, Shape Memory Alloy, Smart composite, Optimization

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