

Graduate Student Research Seminar

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Effects of water absorption on the bistability of thin carbon fiber laminates

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3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

Carbon fiber-reinforced polymer (CFRP) laminates have widespread use in many industries, including aerospace, energy, robotics, and marine applications. Carbon fiber laminates following a [0/90] layup orientation can exhibit bistability, meaning the laminate can snap between two stable geometric configurations when a force. The morphing characteristics of bistable CRFP have a growing interest because of its potential in various applications, including aircraft structures, automotive structures, and energy harvesting. Existing research shows that both moisture and temperature affect CFRP laminates' material properties and performance. However, the influence of moisture absorption on the bistability of carbon fiber composites has not been well studied. This study investigates the effects of moisture sorption on the bistability of thin carbon fiber laminates by analyzing the three-dimensional profile and measuring the force required to snap between the two stable states. This study aims to characterize the effects of moisture sorption at 2, 25, 45 and 65 °C on the bistability of carbon fiber laminates over an extended period of time. The mass of the samples has been measured to quantify the weight percentage of moisture absorption. The preliminary findings indicate that the temperature of the water baths impacts both the amount of moisture uptake and the rate of the bistable curvature relaxation.



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