

Progress and challenges for NDE of composites

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ABSTRACT

The high stiffness to weight ratio, low electromagnetic reflectance and the ability to embed sensors and actuators have made polymer-matrix fiber-reinforced composites an attractive primary construction material for modern high performance structures. However, the multiple step production process and the inherent non-homogeneity of their brittle matrix make these composites susceptible to the formation of many possible defects throughout their life cycle. Another limiting factor in widespread use of composites is their high cost - composite parts are about an order of magnitude more expensive than metallic parts. In addition, the cost of inspection is about 30% of the total cost of acquiring and operating composite structures. This large portion of the total cost makes the need for the development of effective and efficient inspection tools critical not only to the operation but also to the cost benefit of these materials. Conventional inspection methods are capable of providing limited and mostly qualitative information about the degradation of the material properties and of developing defects in composite materials. In recent years, several NDE methods were developed where the anisotropic nonhomogeneous nature of composites is taken into account. In spite of the theoretical and experimental progress, current methods are continuously faced with challenges to meet the growing complex performance requirements that are posed by industry. The progress and challenges for NDE of composites will be reviewed and discussed in this paper.