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Robust composites for airframe health monitoring: Engineering the material, structure and the sensor network

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In order to reduce the possibility of catastrophic failure, airframes require in-built sensing capabilities. In addition to being structurally robust, composite materials with carbon nanotube (CNT) sensor networks can achieve this objective. Both uniform dispersion and selective integration of carbon nanotubes (in form of sheets, yarns and fiber sizing agents) can be used to synthesize these smart composites. Selective CNT integration techniques are particularly useful due to being low cost and low energy input. CNT sheets after surface modification have been found to be compatible with aerospace grade carbon fiber prepregs. Both piezoresistive and electric time domain reflectometry (TDR) sensing techniques can be implemented in these smart composites and correlate well with piezoelectric sensors. However electrical and electromagnetic sensors are not prone to false alarms due to vibrations, unlike piezoelectric sensors.

Biography

Gaurav Pandey is visiting Assistant Professor of Mechanical Engineering at Lafayette College, Pennsylvania, USA. He was awarded a PhD degree in Mechanical Engineering from the University of Delaware in 2013 and a BTech in Aerospace Engineering from the Indian Institute of Technology-Kharagpur in 2009. His PhD research on smart composites has resulted in a joint industrial patent application and several journal publications. At Lafayette College, he is teaching courses in manufacturing, design and mechanics. His present research focus is on composites and sensors.

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