Innov Ener Res 2018, Volume 7
DOI: 10.4172/2576-1463-C1-003

Online structural health monitoring of composites using screen printed nano-composite sensors

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This research aims to develop CNPs based piezoresistive sensor through screen printing and correlate the strain rate to predict the failure response of glass fibre composites. This involves homogenous dispersal of carbon nano- particles (CNPs) in polystyrene (PS) resin through sonication. The smart sensing layer is deposited on glass fibre reinforced composite structures for sensing. The concentration of CNPs was maintained at the percolation threshold of 35% by weight which ensured higher sensitivities and damage detection capability. The composite notched specimens were tested in tension according to ASTM standard to validate the sensing characteristics of the smart layer. It was found that the screen printed smart sensing layers were capable of monitoring strains like traditional strain gauges but with higher gauge factors of 20. The screen printing techniques, due to its low cost and easy implementation, is recommended as a reliable method of sensor integration on various types of substrates including plastics & composites.

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