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New non-linear electrical-thermal switching of carbon nanoparticles/silane coupling agent reinforced phenolic resin nanocomposites

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Abstract
This paper evaluates the use of a new multifunctional conducting polymer containing phenolic resin reinforced by carbon black (CB) nanoparticles modified by silane coupling agent to produce positive temperature coefficient (PTC) thermistors and switching current. The percolation threshold of the conducting composites at room temperature was found to be as low as 4 wt% of CB. Temperature dependent electrical characterisation of phenolic resin/CB nanocomposites is performed. The composites exhibit PTC properties with ρmax/ρmin value as great as 104. Electrical parameters such as charge carriers type, drift mobility, concentration of charge carriers, activation and hopping energy are verified with CB content. The current-voltage curves of the nanocomposites change from linear to non-linear behaviour and the switching current is observed within the non-linear regime.

Author Keywords
Conducting polymer nanocomposites; Electrical properties; Interpenetrating networks

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