PTCR Characteristics of Multifunctional Polymeric Nano Composites

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ABSTRACT : Electrical characteristics of crystalline polymer composites filled with nano-sized carbon black particle were studied. The developed composite system exhibited a typical positive temperature coefficient resistance (PTCR) characteristic, where the electrical resistance sharply increased at a specific temperature. The PTCR effect was sometimes followed by a negative temperature coefficient resistance (NTCR) feature with temperature, which seemingly caused by the coagulation of nano-sized carbon black particles in the excessive quantity. The PTCR temperature was controlled by the carbon black content and the external voltage. The change of electric conductivity was shown as a function of carbon black content, and the resistance was constant when the carbon black content was over 20 wt%. The room-temperature resistance was maintained by a repeated heating and cooling. The excellent PTCR characteristic was demonstrated by the low resistance in the initial stage and the instantaneous heating capability.

Keywords : positive temperature coefficient resistance (PTCR), conducting polymer, thermoplastic polymer, nano-sized carbon black, electrical resistance.