

Development of Thermally Conductive and Electrically Insulative Polymer Composites

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Efficient thermal management of electronics using thermally conductive polymeric composites with electrically insulating property has been highlighted by electronics industries and academic fields because it is the one of the most important factor to determine the performance, reliability, and durability of electronics such as smart phones, laptops, electrical chargers, light-emitting diodes (LED), electric vehicles, and solar cells. For this purpose, various carbon based fillers such as graphite, carbon nanotube, graphene and ceramic fillers such as boron nitride, alumina, zinc oxide have been used. However, all these fillers have limited performances to meet high thermal conductivity, high electrical insulation, and low cost. In this work, we present a new approach for meeting these requirements in which various carbon materials were coated with ceramic fillers by simple sol-gel reaction. The novel ceramic-coated graphite showed much higher thermal conductivity than conventional ceramic materials and greater electrical insulation than carbon materials. Also ceramic-coated carbon fillers significantly improved the thermal stability of polymer composites.

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Biography:

Dr. Sang Eun Shim serves as a professor in the Department of Chemical Engineering at Inha University, South Korea. After graduating from Inha University for his BS and MS degree, he entered the University of Akron in Polymer Engineering with the International Rotary Club Ambassadorial Scholarship and graduated with the OMNOVA Solutions Signature Award. He received Ph.D under the supervision of Prof. Avraam I. Isayev. During his PhD, he serves as a vice-president of Polymer Engineering Student Organization (PESO) at Akron. At Inha University, he was/is an Inha Fellow Professor, vice-dean of budgeting and strategic planning office, and vice-dean of graduate school. He has published over 240 peer-reviewed papers holds over 50 patents. His research fields include thermally conductive composites, electrically conductive composites, EMI shielding composites, thermally insulating composites, high performance cellular materials, carbon nanomaterials-based energy storage materials for batteries/supercapacitors and sensors.

