

論文の内容の要旨

論文題目 Development and characterization of carbon-based nano-fillers/polyaniline hybrids reinforced polymer composites

(炭素系ナノフィラーとポリアニリン複合体を用いた樹脂系複合材料の開発と評価)

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In this work, GO/PANI, MWCNT/PANI and C60/PANI hybrids were employed into polymers by dispersing them into the divinylbenzene (DVB) solution. The conductivity tests were conducted to investigate the difference of three carbon/PANI hybrids. It is observed that the max AC conductivity of CFRP made of MWCNT/PANI was measured to be 22.4 S/m, which has been improved by more than 3 orders of magnitude compared to CF/DVB, and more than 2 orders of magnitude compared to CF/epoxy. GO/PANI hybrids show a cooperative improvement of through-thickness electrical conductivity and interlaminar shear strength (ILSS). For the C60/PANI hybrids reinforced polymer composites, the AC electrical conductivity increased from 9×10^{-10} S/m to 63.7 S/m at the frequency of 1Hz, more than 10 orders of magnitude. On the contrary, the thermal conductivity was reduced to extremely low of only 0.164W/m. K from 0.579 W/m. K. This decoupling of electrical and thermal conductivity of polymer bulk composites opens diverse opportunities for new materials and systems.

These outstanding results make the carbon/PANI hybrids reinforced composites become a competitive material for EMI shielding material, light strike protection

material and thermal electrical materials. This work provides us with a novel vision to design functional materials by utilizing synergetic effects of different ingredients.