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聚丙烯腈改性碳纳米管复合材料的电性能

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Electrical conductivity properties of modified polyacrylonitrile/MWNTs composites

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摘要 采用溶液聚合的方法制备聚丙烯腈, 对聚丙烯腈进行热处理改性后, 与碳纳米管共混制备复合材料. 与未改性处理的复合材料相比, 电导率提高了2个多数量级. 用FTIR、Raman和XPS等方法进行研究, 结果表明聚丙烯腈经热处理改性后, 部分腈基($-\text{C}\equiv\text{N}$)转变为亚胺基($-\text{C}=\text{N}$), 其链状结构向环状结构转化, MWNTs上的 π 电子与改性后聚丙烯腈的 π 电子之间形成强的 π - π 共轭, 增强了改性聚丙烯腈与碳纳米管之间的相互作用, 提高了复合材料的导电性能.

关键词: 多壁碳纳米管 聚丙烯腈 热处理改性 电性能

Abstract: The PAN was synthesised by solution polymerization, modified by heat-treatment and then blended with carbon nanotube to obtain the composites. The electrical conductivity of the composites increased by two orders of magnitude more than that unmodified. Fourier transform infrared spectroscopy (FTIR), Raman spectra and X-ray spectroscopy (XPS) were used to characterize the composites. The results showed that some nitrile were changed into imino, and the chain-like structure also transformed to the cyclic structure after heat-treatment. The strong π - π system was formed between π -electrons of MWNTs and the modified PAN. The interaction between the modified polyacrylonitrile and carbon nanotubes was greatly enhanced. The electrical conductivity was highly improved.

Key words: MWNTs polyacrylonitrile heat-treatment modification electrical conductivity

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