<<聚合物纳米复合材料手册>>

图书基本信息

书名：<<聚合物纳米复合材料手册>>

13位ISBN编号：9787030321374

10位ISBN编号：7030321375

出版时间：2011-9

出版时间：科学出版社

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页数：552

内容概要

聚合物纳米复合材料综合了纳米材料和基体等多种材料特性的优势而成为当前科学界的研究“热点”。
《聚合物纳米复合材料手册》对聚合物纳米复合材料的性能及应用进行了系统的阐述和总结，为聚合物纳米复合材料的应用指明了方向。

《聚合物纳米复合材料手册》首先对聚合物纳米复合材料发展的挑战和机遇进行综述，介绍了不同类型碳纤维的发展史及其在聚合物纳米复合材料中的应用。
然后阐述了纳米材料及其表面处理，以及加工过程中如何解决纳米添加剂与聚合物熔体之间相容性等一系列问题。
其次介绍了结构表征技术，尤其介绍了透射电镜(TEM)的基本原理、样品制备方法及其操作过程。
最后介绍了层基和碳基纳米复合材料的具体性能。
本手册是由
Rakesh K.Gupta教授、Elliot B.Kennel教授及Kwang-Jea Kim研究员共同主编的。

作者简介

作者：(美国)古普塔 (Rakesh K.Gupta) Elliot Kennel Kwang-Jea KimRakesh K.Gnpta，从1992年起一直在西维吉尼亚大学从事教学工作。
Gupta教授先后在印度理工学院坎普尔校区和美国特拉华大学获得工学学士和化学工程专业博士学位。
此前，在纽约州立大学从事教学工作长达11年。
此外，他曾短暂在Monsanto和Dupont公司工作及担任西维吉尼亚区的聚合物联盟的技术顾问。
他的研究领域主要集中在聚合物流变、聚合物加工及聚合物复合材料等方面。
已经出版了《聚合物复合材料流变学》和《聚合物工程基本原理》两部专业书籍。
Elliot B.Kennel，Kennel教授先后在迈阿密大学和俄亥俄州立大学获得物理学专业理学学士和核工业理学硕士学位。
此外，他是：Nanographite Materials，Inc.和Pyrograf Products，Inc.公司的创始人之一。
20世纪80年代早期，在美国空军研究所工作期间，作为早期发起人，他提出P-Tpe掺杂碳纳米管及其纳米复合材料用作高温电导体。
目前，提倡使用煤炭基原料作为低成本纳米复合材料和其他炭产品，如沥青、焦炭。
Kennel教授还曾担任Applied Science，Inc.的副总裁和研究发展主任、美国空军研究所的主管及航天材料和能量转换领域的国内顾问。
Kwang-Jea Kim，目前是美国阿克伦大学的研究员，先后在韩国仁荷大学和阿克伦大学获得表面活性剂合成专业理学硕士和聚合物工程专业理学博士学位，在美国Struktol公司作为研究科学家和项目经理工作五年以上。
然后，他在西维吉尼亚大学化学工程系作为讲师从事教学工作一年。
其研究领域主要集中在聚合物复合材料、界面科学、流变学、反应加工、化学添加剂、纳米材料、有机-无机杂化材料、橡胶及塑料等方面。
Kwang-Jea Kim作为共同作者出版《热塑和橡胶复合物：技术与物理化学》。
目前，作为《纤维素聚合物复合材料界面》的特邀编辑编写了复合材料界面的部分，该书主要涉及木材-塑料复合材料领域。

书籍目录

章节摘录

版权页：插图：1.1 Introduction to the BookNanomaterials，and，in particular，nanoreinforcements for polymer composites have inrecent years been the subject of intense research，development，and commercialization.Aremarkable 1959 talk by Nobel Laureate Richard Feynman at the meeting of the AmericanPhysical Society at Caltech is recognized by many scientific historians as a salient event inthe history of nanotechnology.1 In his talk，Feynman foresaw the development of nanomaterials，nanolithography，nanoscale digital storage，molecular electronics，and nanomanufacturingmethods.Among other things，Feynman famously offered two prizes，for athousand dollars apiece，in which he asked for a working motor smaller than 1/64 of a cubicinch；or to anyone wh could reduce text to the size such that only an electron microscopecould read it（i.e.，nanolithography）.Both prizes were awarded within a few years.Nanomaterials are an important subset of nanotechnology.Feynman was interested notonly in the small dimensions that might be created，but also in the special attributes ofmaterials whose size might be controlled to only a few atomic layers in thickness.Theseattributes，taken together，help to more precisely define the concept of nanomaterials.Thatis，nanomaterials of interest should not only have very small physical dimensions，butshould also exhibit some unusual properties by virtue of their small size；and moreover，the producers of these materials should have control over the dimensions of the materialsand hence the resultant property enhancements.On this basis，it might be argued that a tire made of rubber compounded with carbonblack was one of the earliest primitive nanocomposites.As early as the 1860s，the ability ofcarbon black to enhance the mechanical properties of vulcanized rubber was recognizedby researchers who experimented with adding different materials to the basic rubber formulation.By virtue of its high surface area，surface energy，and mechanical properties，carbon black is able to significantly enhance the properties of rubber.Other well-knownnanoscale reinforcements available in the early twentieth century included fumed silicaand precipitated calcium carbonate.Interest in nano-particle-based polymer composites has expanded significantly since the late 1980s when the patent of Okada et al.1（assigned to Kabushiki Kaisha Toyota Chou Kenkyusho）for in situ polymerization of a Nylon 6/clay nanocomposite with, as stated in claim 1，“ high mechanical strength and excellent high-temperature characteristics ” was issued.1 The results presented in the patent show that polymer nancomposites based on layered silicates provide a significant potential for development of a wide range of enhanced performance polymer compounds. As demonstrated by several researchers，a relatively small loading of properly dispersed（well-exfoliated）organoclay provides a substantial improvement in a polymer's properties.2-6 These include improved thermal properties such as heat distortion temperature（HDT），mechanical properties such as flexural strength and modulus（without significant loss of impact），barrier properties，flame resistance，and abrasion resistance. However，until the early to mid-2000s，there were few commercial materials. Those in the market were mostly based on Nylon 6，and were for niche market applications. The reason for this，at least in part，is that many of the initial composites，such as the Toyota material previously noted，were developed using direct polymerization of a monomer clay mixture. While this method is suitable for certain polymers such as Polyamide 6，the complexity and expense of building a production facility limits entry of many smaller firms into the market. Also，until recently，most development has focused on determining proper surface treatment to make the clay（typically montmorillonite）compatible with the base polymer and therefore improve the ease with which it can be dispersed.Using properly treated clay（i.e.more compatible with the matrix polymer）significantly reduces the degree of difficulty in compounding nanocomposites. For example，a Polyamide 6 and compatible organoclay can be compounded using a mixing-type singlescrew extruder. The result is a nanocomposite where the clay（as determined by XRD and TEM）is partially exfoliated.7 However，comparison of physical properties between the nanocomposite compounded on the single-screw extruder and one compounded on a twin-screw extruder configured with a very mild mixing zone shows significant differences. The modulus of the single-screw extruder compounded material compared favorably with that of material compounded on the twin-screw extruder. However，while the yield strength of the single-screw processed material was better than the base polymer， it was inferior to the twin-screw compounded material. Finally， it was worse than both the base polymer and the twin-screw compounded material in Izod Impact strength. A similar study determined that a single-screw extruder could partially exfoliate a very compatible organoclay to form a Polyamide 6 based nanocomposite；but when a less compatible organoclay was used， a twin-screw extruder was required to improve dispersion.

编辑推荐

《材料科学与应用进展:聚合物纳米复合材料手册(导读版)》全面综述了聚合物纳米复合材料的纳米材料及聚合物基体的合成，聚合物纳米复合材料的发展史、新技术及应用。
通过特征鲜明的科学或工业事例，阐述了聚合物纳米复合材料中的科学、加工和技术的问题。
作者大多是各自领域知名的专家，有的来自全球知名的聚合物纳米复合材料领域的公司，可以为读者提供更好的工业化的指导。
适合复合材料、化学化工、环境等领域的师生、科研人员阅读参考。

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