<<纳米材料、纳米技术及设计>>

图书基本信息

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作者：Michael F. Ashby,Paulo J. Ferreira,Daniel L. Schodek

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前言

There is currently an extraordinary amount of interest in nanomaterials and nanotechnologies, terms now familiar not only to scientists, engineers, architects, and product designers but also to thegeneral public. Nanomaterials and nanotechnologies have beendeveloped as a consequence of truly significant recent advances inthe material science community. Their use, in turn, is expected tohave enormous consequences on the design and engineering ofeverything from common consumer products and buildings all theway through sophisticated systems that support a wealth of applications in the automotive, aerospace, and other industries. Hopesexist for being able to make things smaller, lighter, or work betterthan is possible with conventional materials. Serious problemsfacing society might also be positively addressed via the use ofnanomaterials and nanotechnologies. In the energy domain, forexample, nano-based fuel cells or photovoltaics can potentiallyoffer greater efficiencies than are possible with conventional materials. Developments in nanomaterials and nanotechnologies haveconsequently aroused the interest of many individuals involved inengineering architecture, and product design, whether in the automotive, building, or even the fashion industries.In the excitement surrounding these new materials and technologies, however, their potential can, and has been, frequently overhyped. A mystique surrounds these words that can cloudunderstanding of what nanomaterials and nanotechnologies reallyare and what they can deliver. One of the purposes of this book isto demystify the subject and distinguish what is real from what isnot. Though there is a need to better understand what benefits andcosts might be associated with using nanomaterials, in the designfields little true understanding exists about what these new materials and technologies actually are and how they might be usedeffectively. In the science and engineering domain the situation isoften the converse.

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内容概要

纳米材料和技术涉及的领域极为广阔，从物理、化学，能源、信息科学到生物和医学等专业领域，几乎无所不包。
本书以材料设计(design)和应用为出发点，阐述材料性能和纳米结构的内在联系，并对纳米材料的制备技术做了较为全面的叙述。
本书前3章对纳米材料和技术进行了简要的概括，第4章从定性和定量的角度，介绍材料的分类。结构和性能。
第5章介绍基于材料性能导图．进行材料的选择，优化设计和设计矛盾的解决。
第6—8章较为深入地介绍了纳米材料的主要类型和一般特性，以及它们的制备方法和表征手段。
第9章针对不同设计环境，从定性的角度出发，探讨纳米材料和技术可能发挥的作用。
第10章介绍与建筑，工程、产品设计等领域相关的纳米材料的形式和功能。
第11章概述了纳米材料和技术在医疗、—医药等领域，以及改善环境方面的应用，也涉及健康方面的一些问题。
最后简介纳米材料和技术在其他工业领域的应用，以及未来的发展前景。

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插图：Middle East in the ninth century or before and subsequently spreadthrough Egypt, Spain, and other countries. A particularly fine periodof development occurred in Spain with Hispano-Moresque ware, aglazed ceramic made by Moorish potters largely at Malaga in the15th century and later at Manises near Valencia in the 16th century.To produce this type of lusterware, a glaze was first applied over adesign and the piece fired to produce a thin, hard coating. Glazeswere based on dry powdered minerals or oxides, which commonlyincluded tin and copper. After the first firing, the luster coating,consisting of metallic pigments （normally copper or silver compounds） mixed with clays, was brushed on over the glaze. Then thepiece was fired again but at a lower temperature and within a reducing atmosphere （a condition whereby a reducing agent chemicallycauses a change in a material with metallic compounds to a metallic state by removing nonmetallic constituents as it is itself oxidizedby donating free electrons）. Afterward the piece was cleaned andpolished to reveal the resulting metallic sheen.Later examples include the "tin-glazed" pottery of 15th and 16thcentury Italy and the "copper glazed" lusterware porcelains ofWedgwood in early 19th century England. Several studies of medieval lusterware via transmission electron microscopy （TEM） havebeen undertaken to understand the composition and microstructure of luster. Results have clearly indicated that various lustercharacteristics can be described in terms of the presence of different levels of silver or copper nanoparticles within the glassymatrix. The associated'surface plasmon effects （described previously） cause the appealing metallic sheen to develop. Again,though the artisans producing lusterware lacked an understanding of the chemical processes that achieved the optical effects andwere unaware that their empirical processes led to the creationof nanoparticles, the craft-based development of the requisiteknowledge was remarkable.

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