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Rare earth (RE) materials represent a fascinating group of materials that are attracting burgeoning interest. These materials resemble each other very closely in physical and chemical properties but possess characteristic properties due to their unique electronic configuration, which bestows them with distinctive yet synergistic applications. A variety of functional RE materials have been developed in various fields. However, limitless possibilities of the "technology of small things" motivate the research and development of RE materials for nanotechnology applications. This book provides an in-depth study of the nanotechnology of RE materials. It describes various techniques in derivatizing surface molecules onto nano-size RE materials. A considerable portion of the volume is devoted to the review and discussion of the application of nano-size RE materials as contrast agents for *in vitro* and *in vivo* fluorescence imaging, MRI, and integrated imaging modalities. The text also discusses the application of RE nanomaterials in LEDs.



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