英汉翻译

练习十四

1. Since the beginning of the modern era of chemistry in the nineteenth century, one of the important goals of chemical research has been the discovery and development of materials with useful properties. Chemists have invented both entirely new substances and the means for processing naturally occurring materials to form fibers, films, coatings, adhesives, and substances with special electrical, magnetic, or optical properties. Today, we have entered a new era in which advances in technology will depend more than ever upon the discovery and development of useful new materials.

2. The processing of materials with unique electronic, mechanical, and optical properties plays a critical role in modern technology, offering exciting opportunities for both fundamental and applied research in chemical engineering aspects, including transport phenomena, thermodynamics, chemical kinetics, and materials characterization.

3. Research is being pursued in areas at the cutting edge of electronic materials processing, including crystal growth, thin film deposition and etching, and materials characterization. Both microscopic and macroscopic issues are being explored with experimental techniques and computational tools to uncover fundamental understanding of materials processes. The relationship between processing and the resulting mechanical, electrical, and optical properties is often of particular interest. The development of in situ diagnostic techniques and the use of these and process models in advanced process control schemes is also being considered.

4. Synthesis, processing and characterization of novel materials based on nanometer-sized crystals is a rapidly emerging area of research. Because of the ultrafine crystallite size, semiconductor systems with unique quantum confinement effects can be derived for nonlinear optical and electronic devices. Nanostructured materials with their high grain boundary volume fraction also give rise to unusual transport characteristics and reactivity. They are being exploited for low-temperature sintering and superplasticity for advanced structural ceramics applications.

5. Ceramics are inorganic materials that typically exhibit hardness, rigidity, and high-temperature stability, ceramics find use in a variety of applications where metals, wood, or plastics were traditionally used. The use of ceramics in many applications is limited by their brittle nature, which makes them susceptible to catastrophic failure through crack formation, ceramics can be toughened (made resistant to cracking) by sintering of extremely small particles. One important method for forming small ceramic particles of uniform size is called the sol-gel process. Ceramics can also be made tougher by forming a composite, which is a solid mixture of two or more component materials.

6. Great progress can be anticipated in the development of materials that exhibit new types and ranges of performance. High-temperature superconductors and the recently discovered carbon clusters known as "buckyballs" provide but a glimpse of the possibilities. Today we know only a modest fraction of all the forms and combinations of materials achievable from elements in the highly diverse world of organic molecules, but also in the realm of mixed organic and inorganic materials. A remarkable breadth is emerging in the inorganic sector as well. At present, our use of inorganic materials is heavily weighted toward simpler compounds such as alumina, silica, and silicon nitride. There is much less emphasis on complex inorganic species, except where they occur naturally and except for a few materials such as those being developed as high-temperature superconductors.

7. A key component of new materials will be composites with new compositional and microstructural relationships. A major new area is likely to be composites that contain two or more levels of composite structure, rather than the single level that is typically employed now. One application is for adaptive or "smart" materials that will be capable of changing their physical shape, properties, or both in response to their environment in a way that improves their functionality.