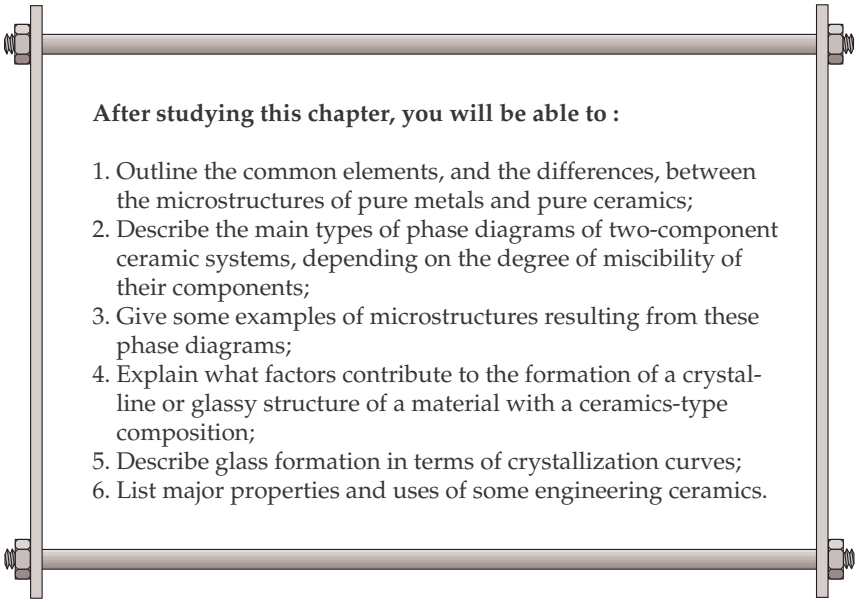
Chapter 10
Ceramics and Glasses

Overview

Ceramics exhibit phenomena analogous to metals when it comes to alloys, phase diagrams, and phase transformations. Binary mixtures of alkali halide ceramics can be anything between completely miscible and not miscible at all, depending on the similarity of the components. Systems with limited miscibility are eutectic, and intermediate compounds are often observed. This type of behavior gives rise to corresponding microstructures, including layered eutectics. Silicates can solidify to form a crystalline or a glassy material, depending on the cooling rate. Engineering ceramics are used primarily where high temperature stability is required. Control of their microstructure facilitates control of material properties, especially mechanical properties, in similar ways as for metals.



After studying this chapter, you will be able to :

1. Outline the common elements, and the differences, between the microstructures of pure metals and pure ceramics;
2. Describe the main types of phase diagrams of two-component ceramic systems, depending on the degree of miscibility of their components;
3. Give some examples of microstructures resulting from these phase diagrams;
4. Explain what factors contribute to the formation of a crystalline or glassy structure of a material with a ceramics-type composition;
5. Describe glass formation in terms of crystallization curves;
6. List major properties and uses of some engineering ceramics.