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## GROWTH

1.5.1 Primary Growth; 1.5.2 Anisotropic Growth; 1.5.3 Surface Growth; 1.5.4 Dendritic and Spherulitic Crystallization; 1.5.4.1 Phenomenology; 1.5.4.2 Dendritic and Spherulitic Crystallization Applications; 1.5.5 Secondary Grain Growth; CHAPTER 2: COMPOSITION SYSTEMS FOR GLASS-CERAMICS; 2.1 ALKALINE AND ALKALINE EARTH SILICATES; 2.1.1 SiO<sub>2</sub>-Li<sub>2</sub>O (Lithium Disilicate); 2.1.1.1 Stoichiometric Composition; 2.1.1.2 Nonstoichiometric Multicomponent Compositions; 2.1.2 SiO<sub>2</sub>-BaO (Sanbornite); 2.1.2.1 Stoichiometric Barium-Disilicate; 2.1.2.2 Multicomponent Glass-Ceramics; 2.2 ALUMINOSILICATES; 2.2.1 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub> (Mullite); 2.2.2 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-Li<sub>2</sub>O (-Quartz Solid Solution, -Spodumene Solid Solution); 2.2.2.1 -Quartz Solid Solution Glass-Ceramics; 2.2.2.2 -Spodumene Solid-Solution Glass-Ceramics; 2.2.3 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>2</sub>-Na<sub>2</sub>O (Nepheline); 2.2.4 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-Cs<sub>2</sub>O (Pollucite); 2.2.5 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-MgO (Cordierite, Enstatite, Forsterite); 2.2.5.1 Cordierite Glass-Ceramics; 2.2.5.2 Enstatite Glass-Ceramics; 2.2.5.3 Forsterite Glass-Ceramics; 2.2.6 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-CaO (Wollastonite); 2.2.7 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-ZnO (Zn-Stuffed -Quartz, Willemite-Zincite); 2.2.7.1 Zinc-Stuffed -Quartz Glass-Ceramics; 2.2.7.2 Willemite and Zincite Glass-Ceramics; 2.2.8 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-ZnO-MgO (Spinel, Gahnite); 2.2.8.1 Spinel Glass-Ceramic Without -Quartz; 2.2.8.2 -Quartz-Spinel Glass-Ceramics; 2.2.9 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-CaO (Slag Sital); 2.2.10 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-K<sub>2</sub>O (Leucite); 2.2.11 SiO<sub>2</sub>-Ga<sub>2</sub>O<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub>-Li<sub>2</sub>O-Na<sub>2</sub>O-K<sub>2</sub>O (Li-Al-Gallate Spinel); 2.2.12 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-SrO-BaO (Sr-Feldspar-Celsian); 2.3 FLUOROSILICATES; 2.3.1 SiO<sub>2</sub>-(R<sub>3</sub><sup>+</sup>)<sub>2</sub>O<sub>3</sub>-MgO-(R<sub>2</sub><sup>+</sup>)O-(R<sup>+</sup>)<sub>2</sub>O-F (Mica); 2.3.1.1 Alkaline Phlogopite Glass-Ceramics; 2.3.1.2 Alkali-Free Phlogopite Glass-Ceramics; 2.3.1.3 Tetrasilic Mica Glass-Ceramic; 2.3.2 SiO<sub>2</sub>-Al<sub>2</sub>O<sub>3</sub>-MgO-CaO-ZrO<sub>2</sub>-F (Mica, Zirconia)

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### Sommario/riassunto

Glass-ceramic materials share many properties with both glass and more traditional crystalline ceramics. This new edition examines the various types of glass-ceramic materials, the methods of their development, and their countless applications. With expanded sections on biomaterials and highly bioactive products (i.e., Bioglass and related glass ceramics), as well as the newest mechanisms for the development of dental ceramics and theories on the development of nano-scaled glass-ceramics, here is a must-have guide for ceramic and materials engineers, managers, and designers in the ceramic and

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