

Preface

Transparent polycrystalline ceramics have been found various applications as laser hosts, infrared (IR) windows/domes, lamp envelopes, and transparent armors, instead of their glass and single-crystal counterparts, due to their processing flexibility in fabricating items with large sizes and complex shapes and more importantly cost-effectiveness. High optical transparent ceramics require high purity and high density. To achieve high-purity final products, it is necessary to use high-purity precursor powders, which requires the use of various advanced synthetic methods, such as chemical coprecipitation, sol-gel, thermal spray and spray pyrolysis. To get full density, various sintering technologies have been employed, such as high-pressure (HP) sintering, hot isostatic pressure (HIP) sintering, vacuum sintering and spark plasma sintering (SPS). It is important to understand the interrelationship among powder synthesis, characteristics, compaction, sintering, microstructure, grain size and performances in solid-state lasers and other applications.

Although various books on solid-state lasers and ceramic processing have been available in the open literature, very less information is present to cover both the solid-state lasers and processing of transparent ceramics, due to the multidisciplinary or interdisciplinary characteristics. The purpose of this book is to bridge these two very important fields. It consists of 10 chapters, covering the topics of transparent ceramic materials, ceramic powder synthesis, powder characterization and compaction, fundamentals of sintering, new sintering techniques, microstructural development of transparent ceramics, densification of transparent ceramics by using different methods, solid-state ceramic lasers and other applications of transparent ceramics. The book can be used as a reference for senior undergraduate students, postgraduate students, researchers and engineers, in materials science and engineering, applied physics, solid-state lasers, solid-state physics, and so on.

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