

Abstract of thesis

Sesquioxide transparent ceramics such as Y_2O_3 , Lu_2O_3 , and Sc_2O_3 , have received a great attention as promising host materials for high powder solid-state lasers. To meet the laser applications requirements, porosity of the ceramics must be minimized. Densification of ceramics is closely related to quality of powders, sintering additives and sintering techniques.

In the present research, comprehensive studies concerning the powder synthesis, sintering additive behavior and sintering controls were conducted. It has been demonstrated that dispersants have great influence on the morphology and dispersity of both precursors and calcined powders. The utilization of spraying technique provided another way to reduce powder agglomerations. The role of CaO and CaO-ZrO₂ as sintering additives in the Y_2O_3 ceramic densification were explored. By optimizing the powder quality and sintering strategy, rare-earth doped sesquioxide transparent ceramics like Yb:Lu₂O₃ and Nd:Y₂O₃ with high lasing efficiency have been realized.