CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : Université Clermont Auvergne
INP Clermont Auvergne

Mardi 23 juin à 16 h

Amphi Rémi (site des Cézeaux)

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Advancements and challenges in sintering of Cr^{4+}:YAG transparent ceramics

This work focuses on the influence of the single additives and their combinations on the sintering trajectory of Cr^{4+}:YAG ceramics.

Since the first successfully synthesized transparent Nd:YAG ceramics (Ikesue et al. 1995), the progress in transparent ceramic technology has significantly expanded the scope of applications for both continuous wave (CW) and pulsed lasers. The most popular host for solid-state lasers is Nd:YAG, which occupies more than half of the laser crystals market. A large fraction of the laser market is occupied by passive Q-switched lasers, which can operate in so-called “giant pulse” generation mode. The crucial component of these lasers is phototropic material. Cr^{4+}:YAG remains the best choice for Q-switched lasers and suppresses all other alternatives (the exception of LiF crystals, which are expensive and short-lived). Global Cr^{4+}:YAG Crystals Market Size, Scope, and Forecast Report highlights that the Cr^{4+}:YAG Crystals Market has witnessed swift and substantial growth in recent years, with projections indicating a continued significant expansion from 2023 to 2031.

Despite the importance of Cr^{4+}:YAG ceramics, there is a limited number of published research articles. The reason for this is the challenges that arise in Cr^{4+}:YAG transparent technology. One of the key components of YAG transparent ceramic technology is the use of a TEOS sintering additive. Sintering of transparent YAG ceramics without TEOS sintering additives is one of the most promising directions for further development of transparent ceramics. So far, there are only a few papers that have reported the sintering of Nd:YAG transparent ceramics without using TEOS sintering additives. Sintering of high-quality Cr^{4+}:YAG transparent ceramics requires the absence of TEOS sintering additives, which is a challenge by itself. Moreover, Cr^{4+}:YAG requires the presence of Ca^{2+} and/or Mg^{2+} charge compensation, which further complicates this task. The work focuses on the influence of the single additives and their combinations on the sintering trajectory of Cr^{4+}:YAG ceramics [1].

References:

[1] Chaika, M. (2024). Advancements and challenges in sintering of Cr^{4+}:YAG: A review. *Journal of the European Ceramic Society*, 44 (13), 7432-7450

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