



CYCLE DE CONFÉRENCES DE CHIMIE

**Avec le concours de : Université Clermont Auvergne
INP Clermont Auvergne**

Mardi 23 juin à 11 h

Amphi Rémi (site des Cézeaux)

Mykhailo CHAIKA

*Department of Optical Spectroscopy, Institute of Low Temperature and Structural Research,
Wrocław, Poland*

Advancements and challenges in sintering of Cr⁴⁺:YAG transparent ceramics

This work focuses on the influence of the single additives and their combinations on the sintering trajectory of Cr⁴⁺: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. Cr⁴⁺: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 Cr⁴⁺:YAG Crystals Market Size, Scope, and Forecast Report highlights that the Cr⁴⁺: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 Cr⁴⁺:YAG ceramics, there is a limited number of published research articles. The reason for this is the challenges that arise in Cr⁴⁺: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 Cr⁴⁺:YAG transparent ceramics requires the absence of TEOS sintering additives, which is a challenge by itself. Moreover, Cr⁴⁺:YAG requires the presence of Ca²⁺ and/or Mg²⁺ 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 Cr⁴⁺:YAG ceramics [1].

References:

[1] Chaika, M. (2024). Advancements and challenges in sintering of Cr⁴⁺:YAG: A review. *Journal of the European Ceramic Society*, 44 (13), 7432-7450

Coordinateurs : Alain DEQUIDT ☎ 33 473 407 194 courriel : alain.dequidt@uca.fr

Kévin LEMOINE ☎ 33 473 407 513 courriel : kevin.lemoine@uca.fr

Institut de Chimie de Clermont-Ferrand (ICCF-UMR 6296)

Université Clermont Auvergne, 24, avenue Blaise Pascal, TSA 80026 63178 AUBIERE cedex-France