

Yb:CaGdAlO₄

Introduction

Yb:CaGdAlO₄(called CALGO) is a promising new laser gain material which possess several important advantages. The crystal structure of CALGO is tetragonal. When it is pumped at 979nm under pi configuration, we can get broad emission spectra from 994nm to 1050nm in theta configuration. This implies a very small quantum defect (down to 1.5%) and gives a good expectation of obtaining ultra-short pulse. Its thermal conductivity is also high: $k=6.7\text{W/m/K}$, which means it can be used for high power laser applications.

CASTECH's Yb:CaGdAlO₄ is featured by

- High absorption coefficient @979nm;
- High stimulated emission cross section;
- Low laser threshold;
- Extremely low quantum defect;
- Broad output @994-1050nm;
- High slope efficiency with diode pumping (up to 55%);
- Various Yb-doping concentration.



Applications

- Over 5.5W output power is obtained by 23w incident pumping diode laser with 10% output coupler;
- Output power as high as 12.5W and 94fs pulses for 28W pumping power was reported.

Table1. Basic Properties

Crystal structure:	Tetragonal
Point group:	I4/mmm
Cell Parameters:	$a=3.6585\text{\AA}$; $c=1.1978\text{\AA}$
Mohs hardness:	6
Density(g/cm ³):	4.8
Melting Point:	1850°C
Thermal conductivity(W/m/K):	$K_{[100]}=6.3$; $K_{[110]}=6.9$
Thermal expansion coefficient(10 ⁻⁶ /K):	10.1(// a); 16.2(// c)
Laser Wavelength:	994-1050nm
Absorption Wavelength:	979nm
Absorption Cross Section (phi configuration at 979nm):	$2.7 \times 10^{-20} \text{ cm}^2$

Table 2. Specifications of Yb:CaGdAlO₄

Orientation	a or c
Standard dopant concentration (at.%)	2%, 3%, 5%
Maximum length	50mm
Length tolerance(mm)	+0.5/-0.2
Diameter tolerance(mm)	+/-0.1
Parallelism	<30''
Perpendicularity	<15'
Surface quality	20/10
Coating	AR-coated