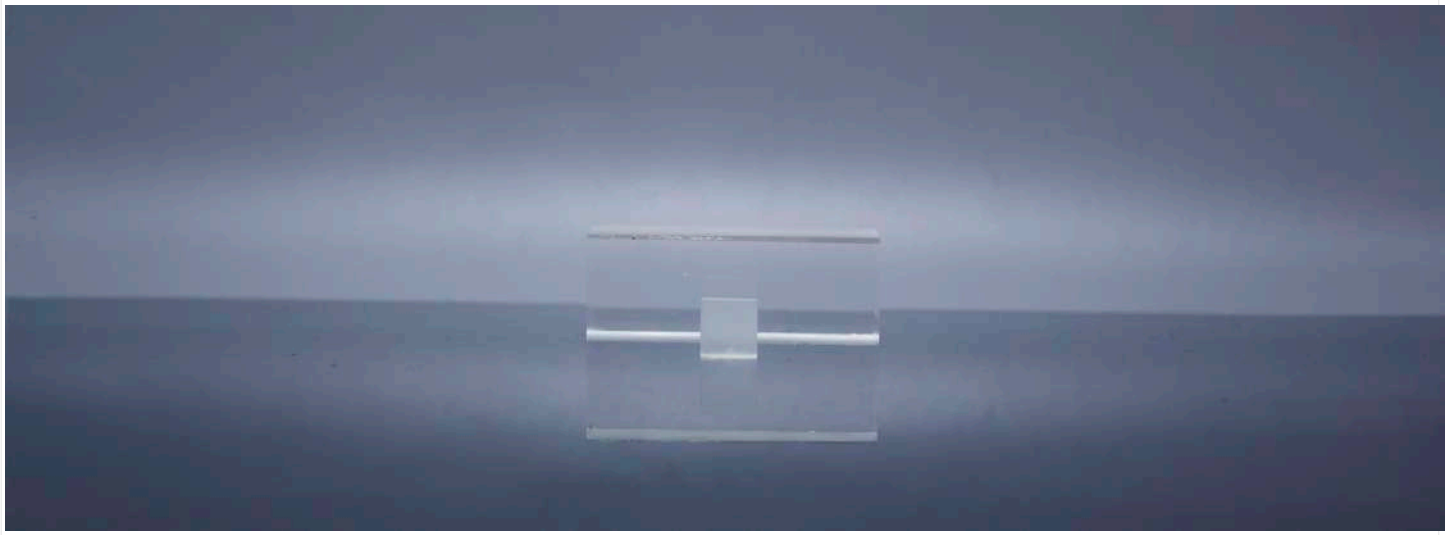
$LaCl_3$



DESCRIPTION

LaCl3 crystal has UCl3 type structure, space group P63/m, and it has attracted much attention for its high light output as well as good energy resolution. These unique properties made LaCl3 crystal a promising material as scintillator in the field of high-energy physics experiments and medical imaging, as well. LaCl3 (doped with 10% Ce3+) has a very high light output (49,000 photons/MeV), and fast principle decay time constant (26 ns) . These properties make LaCl3:Ce a very promising material for gamma-ray spectroscopy.

LaCl3 crystal belongs to hexagonal system, density is 3.8g/cm3. Its energy resolution is 3.1%, decay time With 26 ns and a time resolution of 224 ps, there is almost no damage after exposure to gamma rays up to 3 kGy. Such excellent scintillation performance is very rare in inorganic compounds. The energy is 60 keV to 1275 keV. Under the excitation of γ-ray source, the nonlinear response coefficient of light output is 7%, which is far superior to LSO:Ce crystal (35%), NaI: Tl crystal (15%) and CsI: Tl (20%). Based on its good numbers, this scintillation material can find its place in such applications as medical imaging, nuclear physics, X-ray diffraction, non-destructive evaluation, treaty verification and safeguards, environmental monitoring, and geological exploration.

APPLICATIONS

- Safety inspection
- Geological exploration
- Environmental testing
- Medical – SPECT
- Industrial – Well logging
- Nuclear and high energy physics – specialist applications

FEATURES

- Excellent energy resolution
- Good time resolution
- High chemical resistance
- Fast decay times – 28nsec
- High light outputs – 49,000 Photons/MeV
- Optical outputs with good linearity with temperature
- Excellent radiation hardness

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LaCl3

PARAMETERS

Material and Specifications

Material	LaCl3
Appearance	white odorless powder
Crystal structure	hexagonal (UCl3 type), hP8
Space group	P63/m, No. 176
Lattice constant	a = 0.74779 nm, b = 0.74779 nm, c = 0.43745 nm
Formula units (Z)	2
Coordination geometry	Tricapped trigonal prismatic,(nine-coordinate)

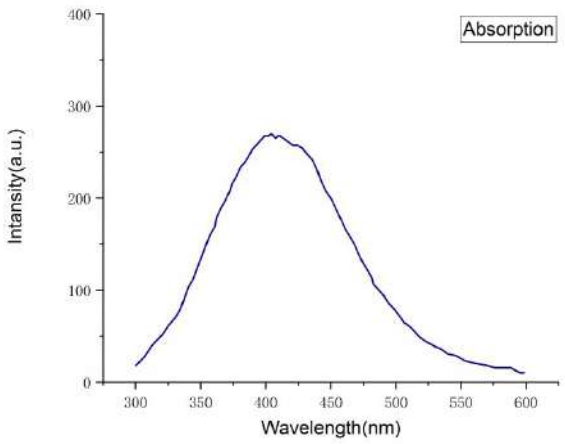
Physical and Chemical Properties

Density (g/cm3)	3.8
Melting point	860 °C
Boiling point	1,000 °C
Solubility in water	957 g/L (25 °C)

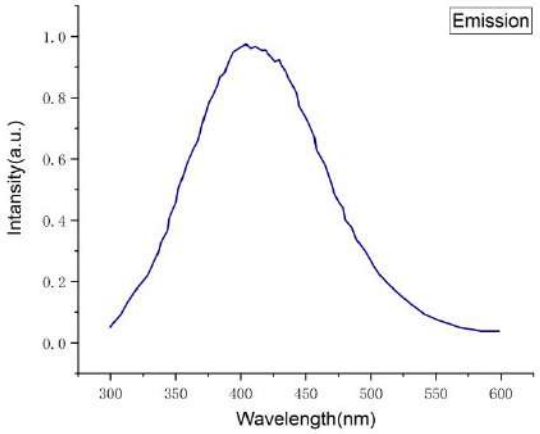
Optical and Spectral Properties

Emission peak (nm)	350, 430
Decay time (ns)	28
Energy resolution R (%)	10.5 ± 0.9
Photon yield (103 ph/MeV)	34 ± 1
Light yield (photons/keV)	49
Light output (photons/MeV)	50500
Absorbed γ-ray energy (keV)	662, 60
Photoelectron yield [% of NaI(Tl)](for γ-rays)	35

Spectrum



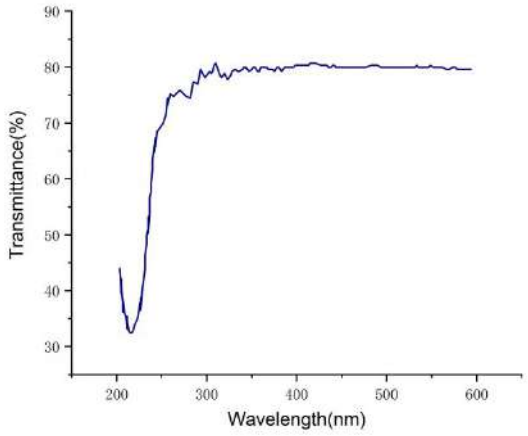
LaCl3 Absorption Spectra



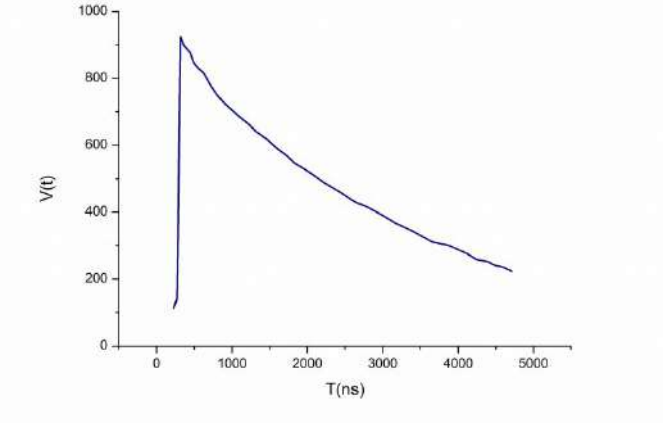
LaCl3 Emission Spectra

LaCl3

Spectrum



LaCl3 Emission Spectra



LaCl3 Decay Time