

DESCRIPTION

CsI(Tl) is one of the brightest scintillators. The maximum of the broad emission is situated at 550nm and the emission is, therefore, not well matched to a bi-alkali photocathode photomultiplier tube. This results in a photoelectron yield for γ -rays which amounts to 45% of the value for NaI(Tl). Since CsI(Tl) has most of its emission in the long wavelength part of the spectrum, the material is well-suited for photodiode readout. CsI(Tl) has a light output of 54 photons/ keV and is one of the brightest scintillators known. It has been widely used in many fields, such as Security check, Detection of neutrinos, Detection of neutrinos γ -ray, XCT.

Cesium Iodide, activated with Sodium – CsI(Na) – is one of the brightest available scintillators, with a broad emission peaking at 420nm. CsI(Na) has good stopping power, physically rugged and well suited to a broad range of applications. Na-doped cesium iodide (Na:CsI) is an important alkali metal halide inorganic scintillator that is widely used as laser-stimulable transparent film and X-ray detection materials.

Undoped CsI, also called CsI(pure) has an emission maximum at 315nm with an intensity one tenth that of the doped CsI crystals. It exhibits fast (~ 10 ns) emission, peaking at 310 nm, but its scintillation yield at room temperature is very low. But its light yield at 77 K reaches an impressive 100,000 ph/MeV, that makes pure CsI a very attractive scintillator for detector applications at low temperatures.

APPLICATIONS

- Geological logging
- Specialist applications in high energy, nuclear, space and medical physics
- Detection of neutrinos
- Position sensitive detector
- Security check
- Detection of neutrinos γ -ray
- Industrial CT camera
- PET-CT

PARAMETERS

Material and Specifications

Chemical formula	CsI
Appearance	white crystalline solid
Crystal structure	CsCl, cP2
Space group	Pm3m, No. 221[5]
Lattice constant	a = 0.4503 nm
Lattice volume (V)	0.0913 nm ³
Formula units (Z)	1
Coordination geometry	Cubic (Cs ⁺)
	Cubic (I ⁻)

FEATURES

- Relatively bright
- Good absorbers with good stopping powers
- Broadly emitting with a 420nm peak, well matched to use with PMTs
- Robust with good mechanical characteristics
- Easy growth
- High photoelectric conversion efficiency
- Low melting point

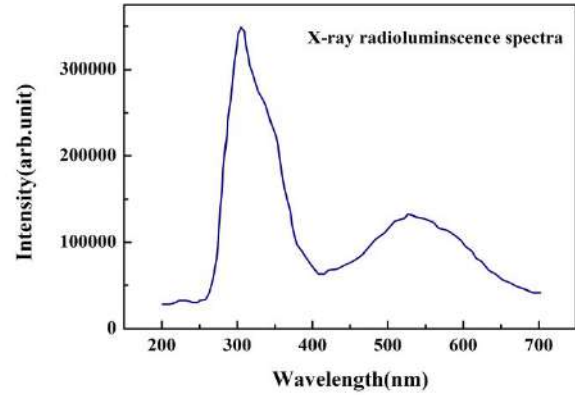
Optical and Spectral Properties

Chemical formula	Tl:CsI	Na:CsI	CsI
Wavelength (Max. emission) (nm)	550	420	315
Wavelength range (nm)	320-	300-	260-
Decay time (ns)	900	300	16
Light yield (photons/keV)	54	41	2
Light output relative to NaI(Tl)(%)	45	85	5
Refractive index	1.8@550nm	1.84@420nm	1.95
Radiation length (cm)	1.86	1.86	1.86
Optical transmission (μ m)	TBA	TBA	/
Transmittance (%)	TBA	TBA	/
Reflection loss/surface (%)	TBA	TBA	/
Neutron Capture Cross-section (barns)	1.47	TBA	/
Afterglow (%)	0.5-5.0	0.5-5.0	/

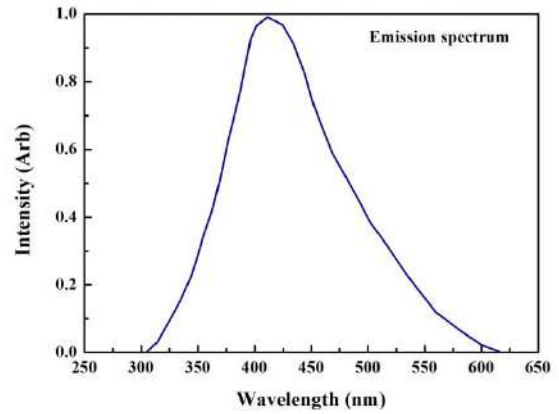


Physical and Chemical Properties

Chemical formula	Tl:CsI	Na:CsI	CsI
Density (g/cm ³)	4.51	4.51	4.51
Melting point (°C)	894	621	894
Hardness (Mho)	2	2	2
Hygroscopic	Slightly	Yes	Slightly
Cleavage	No	No	No
Solubility (g/100gH ₂ O)	N/A	N/A	/
Thermal expansion coeff (C-1)	54*10-6	54*10-6	54*10-6



CsI X-ray radioluminescence spectra



Na-CsI emission spectrum

Spectrum

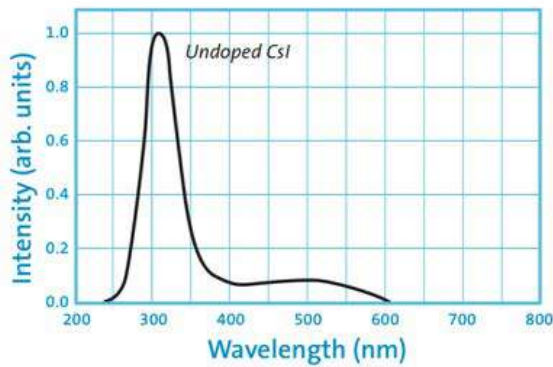
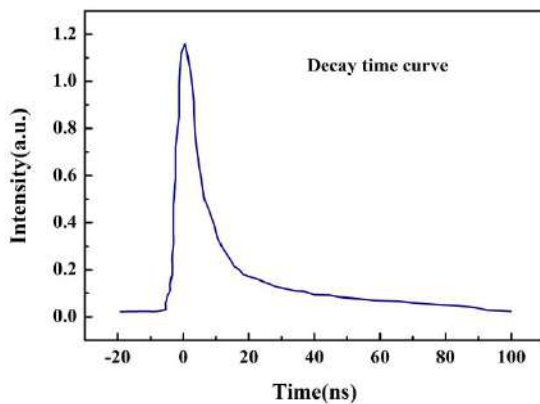
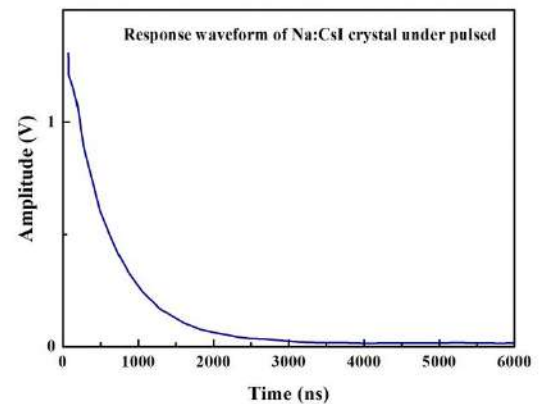


Figure 1. Scintillation emission spectrum of CsI (pure)

CsI emission spectra



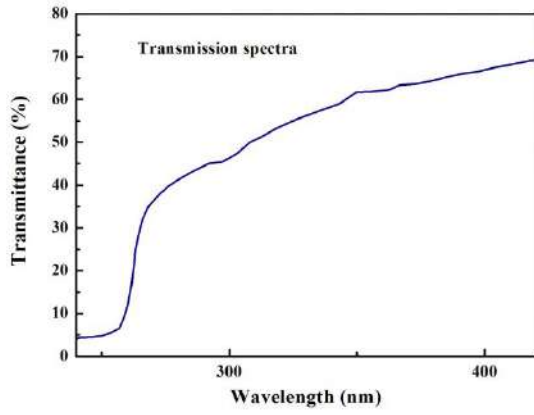
CsI decay time



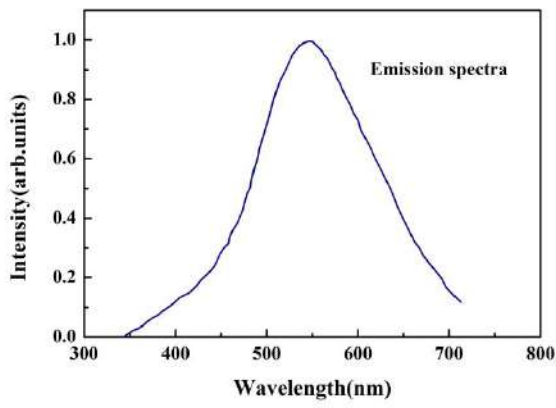
Na-CsI response waveform



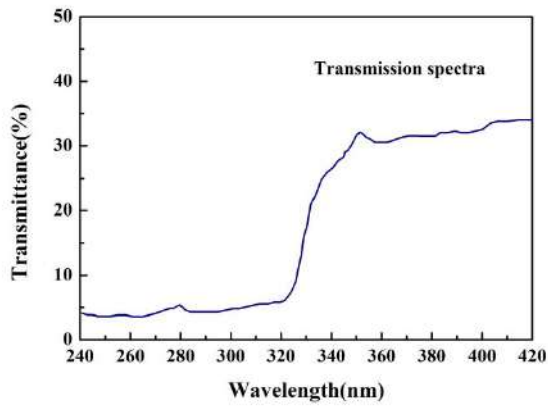
Spectrum



Na-CsI transmission spectra



TI-CsI Emission spectra



TI-CsI Transmission spectra

