

CsI

Caesium Iodide

◆ Key Properties of Caesium Iodide (CsI)

- ❖ Wide Spectral Transmission: Excellent transmission from ~200 nm (UV) to ~55 µm (far IR).
- ❖ High Refractive Index: ~1.74 @ 10 µm — ideal for compact infrared systems and detectors.
- ❖ Scintillation-Ready: Emits visible light under X-ray/gamma exposure — ideal for radiation detection.
- ❖ Moisture Sensitive: Slightly hygroscopic — best handled in dry environments or with protective coatings.
- ❖ Soft and Workable: Easily machined for custom optics — suitable for low-volume and prototype builds.
- ❖ High Density: ~4.51g/cm³ — enhances resolution in radiation and particle detection systems.
- ❖ IR-Specialist Material: Widely used in FTIR, thermal imaging, and vacuum optics.

❖ Applications of Caesium Iodide (CsI)

❖ Scientific & Radiation Detection

- Scintillation Detectors: Commonly used in X-ray and gamma-ray detectors due to its luminescence when exposed to high-energy particles.
- Particle Physics: Applied in calorimeters and high-energy physics experiments as a fast scintillation material.

❖ Infrared & Spectroscopy Systems

- FTIR Windows: Transparent across a wide IR spectrum (200 nm–55 μm), making it ideal for spectroscopy cells and beam splitters.
- Vacuum Optics: Suitable for low-pressure IR systems due to its wideband performance and good polishability.

❖ Imaging & Thermal Sensing

- Thermal Cameras: Used in long-wave IR optical systems and sensor protection windows.
- Remote Sensing Equipment: Integrated into satellite and airborne IR instruments.

⚠ Specialized & Custom Optics

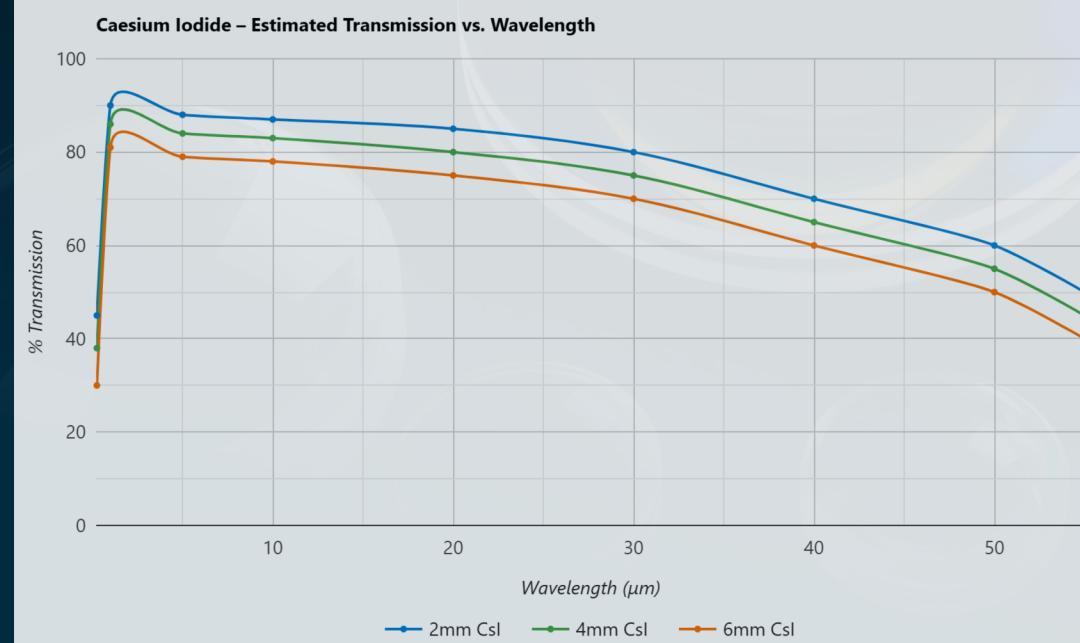
- Research-Grade Blanks: Custom fabricated for niche applications requiring far-infrared transparency.
- Coated IR Components: Often AR-coated or protected with parylene for stability in ambient conditions.

Technical Parameters of Caesium Iodide (CsI)

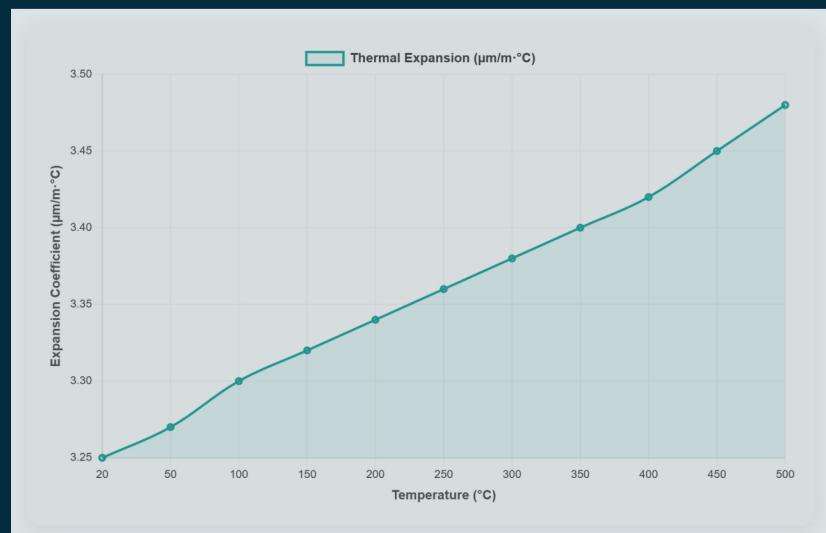
Property	Typical Value
Transmission Range	~200 nm to 55 µm
Refractive Index	~1.74 @ 10 µm
Density	4.51 g/cm ³
Hardness (Knoop)	~25 kg/mm ²
Melting Point	~621 °C
Solubility in Water	~44 g/100 mL @ 25 °C
Crystal Structure	Cubic
Hygroscopic	Yes – requires dry handling or protective coating
Scintillation Use	Yes – emits visible light when exposed to X-rays or gamma rays
Chemical Formula	CsI
Thermal Conductivity	~1.8 W/m·K
Applications	FTIR, IR optics, scintillators, radiation detection, space optics
Coating Compatibility	Parylene, DLC recommended for moisture protection

Caesium Iodide is a highly sensitive optical and scintillation material with excellent transmission from the ultraviolet through to the far infrared (~200 nm to 55 µm). With a refractive index of approximately 1.74 at 10 µm and a density of 4.51 g/cm³, it offers reliable optical performance across a wide spectral range. CsI has a cubic crystal structure, a melting point of ~621 °C, and moderate thermal conductivity (~1.8 W/m·K). While hygroscopic and requiring careful handling or protective coating, it is valued for its ability to emit visible light under X-ray or gamma-ray exposure—making it ideal for scintillation detectors, FTIR systems, and space-based optical instruments. Protective coatings such as Parylene or DLC are recommended to ensure long-term stability in humid environments.

Caesium Iodide (CsI) Transmission Graph



🔍 Data updated to reflect realistic transmission: 0.25–55 μm working range, ~87–90% in mid-IR
📝 Actual measurement data from stock-quality CsI windows (2–6 mm) available on request.



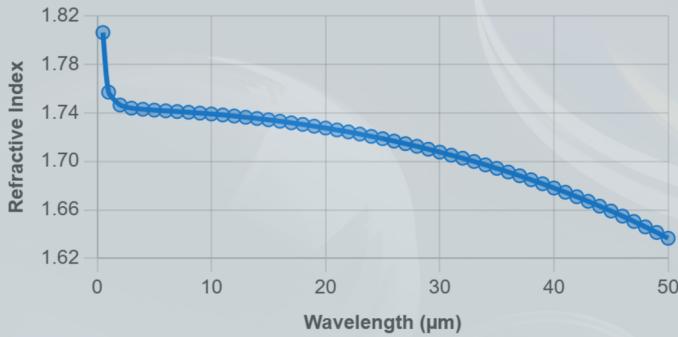
Transmission:

Caesium Iodide (CsI) offers exceptionally wide spectral transmission, spanning from approximately 0.2 μm to 55 μm, covering the ultraviolet, visible, and far-infrared regions. Typical transmission exceeds 85–90% in the mid-IR, making CsI ideal for FTIR spectroscopy, thermal imaging, and space optics where deep IR performance is required.

Thermal Expansion:

CsI exhibits a relatively high coefficient of linear thermal expansion, averaging around $54 \times 10^{-6} / ^\circ\text{C}$ at 20 °C. The expansion rate increases gradually with temperature, so components should be mounted using flexible or low-stress designs to prevent cracking. Despite its softness and hygroscopic nature, CsI maintains stable optical properties under controlled environments when properly sealed or coated.

Refractive Index of Caesium Iodide (CsI) vs. Wavelength



Real-world measurement data (CSV loaded dynamically)

Wavelength	Refractive Index
0.5	1.8064
1	1.7572
2	1.7466
3	1.744
4	1.7431
5	1.7424
6	1.7418

FAQ

Q: What is Caesium Iodide used for?

A: CsI is used in infrared optics, X-ray and gamma-ray detection, scintillation detectors, and medical imaging systems. It offers excellent transmission in the UV to IR range and strong scintillation properties.

Q: Is Caesium Iodide suitable for IR applications?

A: Yes, CsI has a very broad transmission range (typically from $0.2\text{ }\mu\text{m}$ to $55\text{ }\mu\text{m}$), making it ideal for infrared and vacuum UV optics.

Q: Is CsI hygroscopic?

A: Yes, CsI is strongly hygroscopic and must be handled in dry environments or sealed properly. Prolonged exposure to moisture can degrade its surface and optical performance.

Q: How mechanically durable is Caesium Iodide?

A: CsI is a soft, brittle crystal with low hardness. It requires careful handling during fabrication and use, especially in uncoated forms.