

## Inorganic Scintillators Materials Data Sheet

### Introduction

Pycko Scientific can offer many different scintillation detector materials for radiation detection and measurements. These materials are available in custom sizes and shapes for numerous applications.

These materials are available in several detector configurations including: open face, thin, thin integral, thin window, demountable, side well, end well, environmental, ruggedized, annular types, ultra-low background and more. Pycko Scientific has extensive capability for building custom designs.

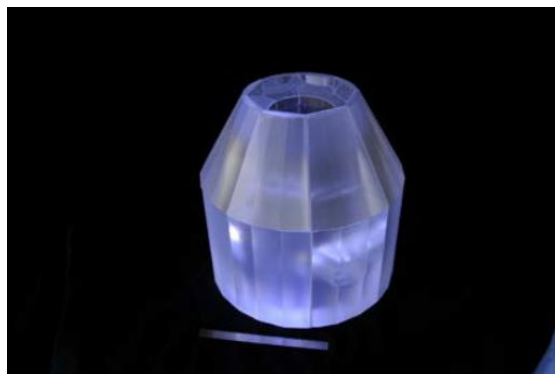


Figure 1. Special BGO Compton Suppression Detector – Bare Crystal.

### Scintillator General Properties and Typical Applications

Scintillator Material	Advantages	Examples of Applications
Nal(Tl)	Good light yield, best cost	General counting, x-ray counting, dose calibration, commercial gauges, health physics, Compton Suppression, medical imaging, geophysical exploration, homeland security, dark matter experiments
CsI(Na)	Good light yield, rugged	Geophysical exploration, general counting
CsI(Tl)	Non-hygroscopic, rugged	Photodiodes, high energy physics, phoswiches
CsI(pure)	Fast light output	Calorimetry
BGO	High density	Geophysical exploration, general counting, Compton Suppression, geophysical exploration
CaF <sub>2</sub> (Eu)	Non-hygroscopic, good light yield	β detectors, special α – β phoswiches
CeBr <sub>3</sub>	Very good light yield, fast light output	Geophysical exploration, hand held meters
LaCl <sub>3</sub> (Ce)	Very good light yield, fast light output	Geophysical exploration, hand held meters
<sup>6</sup> LiI(Eu)	Good light yield, good neutron cross section	Thermal neutron detection, gamma spectroscopy
<sup>6</sup> Li-glass	Good neutron cross section, non-hygroscopic	Thermal neutron detection
CdWO <sub>4</sub>	High density, low afterglow	Photodiodes, high count rate x-ray scanners
BaF <sub>2</sub>	Very fast light output	Fast timing, nuclear physics research
LYSO	High density, fast light output	General counting, commercial gauges
SrI <sub>2</sub> (Eu) <sup>2</sup>	Very Good light yield	Hand held meters
Plastic	Fast light output, low density, good light yield	Screening monitors, particle detection, β monitors
Liquid	Fast light output, low density, good light yield	Nuclear physics research

<sup>2</sup>Materials under development.

## Properties of Scintillation Detector Materials

Scintillator Material	Density [g/cm <sup>3</sup> ]	Hygroscopic	Emission Wavelength [Max.]	Light Yield <sup>3</sup> [NaI(Tl)=100] [%]	Principle Decay Time [μsec] <sup>4</sup>	Index of Refraction <sup>5</sup> n
NaI(Tl)	3.67	Yes	415	100	0.23	1.85
CsI(Na)	4.51	Slightly	420	85	0.63	1.84
CsI(Tl)	4.51	No	550	456	0.68	1.80
CsI(pure)	4.51	No	315	4-6	0.016	1.95
BGO	7.133	No	480	20	0.3	2.15
CaF <sub>2</sub> (Eu)	3.18	No	435	50	0.9	1.44
CeBr <sub>3</sub>	5.07	Yes	380	155	0.019	2.09
LaCl <sub>3</sub> (Ce)	3.79	Yes	330/352	120	0.070/0.0003	1.81
<sup>6</sup> LiI(Eu)	4.08	Yes	470	35	1.4	1.96
<sup>6</sup> Li-glass	2.6	No	390-430	4-6	0.060	1.56
CdWO <sub>4</sub>	7.90	No	480	30-50	20	2.20
BaF <sub>2</sub>	4.89	Yes	220/320	3/16	0.62/0.0006	1.47
LYSO	7.3	No	397	75	.00041	1.82
SrI <sub>2</sub> (Eu) <sup>2</sup>	4.59	Yes	~430	~210	~0.003	1.85
Plastics	1.02	No	370	25-30	0.00141	1.58
Liquids	1.00	No	425	35-45	3.2	1.505

<sup>2</sup>Materials under development.

<sup>3</sup>Light Yield: when coupled to a PMT with a Bialkali photocathode at room temperature.

<sup>4</sup>At room temperature.

<sup>5</sup>At the maximum wavelength of emission.

<sup>6</sup>Best suited to be used with a photodiode due to wavelength mismatch with standard PMT.