

BC-454

Natural Boron-loaded Premium Plastic Scintillator

BC-454 is a boron-loaded, plastic scintillator formulated to provide efficient detection of fast and slow neutrons. The standard material contains natural boron (19.9% ^{10}B) at a concentration of 5% by weight. Low energy neutrons are detected through the ^{10}B (n, d) capture reactions, and high energy neutrons are detected via elastic scattering of protons.

The principal application of this material is total-absorption neutron spectrometry. A fast neutron will produce a prompt recoil proton pulse. Neutrons that are sufficiently thermalized within the scintillator are likely to undergo the ^{10}B (n, d) capture. A capture pulse, in delayed coincidence with the prompt pulse, is used to identify neutron events. For neutron energies below 200keV, the capture time constant is dependent only on the ^{10}B concentration. For a 5% boron loading, the capture time constant is approximately 2.7 μs .

BC-454 is available as sheets, rods, thin films and fibers. Other boron concentrations up to 10% are available on request.

General Technical Data –

Base	Polyvinyltoluene
Density	1.026 g/cc
Refractive Index	1.58
Coefficient of Linear Expansion 7.8x10 ⁻⁵ below 65°C
Vapor Pressure...	May be used in a vacuum
Solubility	Soluble in aromatic solvents, chlorinated solvents, acetone, etc. Unaffected by water, dilute acids, lower alcohols, alkalis and pure silicone fluids or grease.
Softening Point	60°C

	% Boron Loading		
	1%	5%	10%

Scintillation Properties –

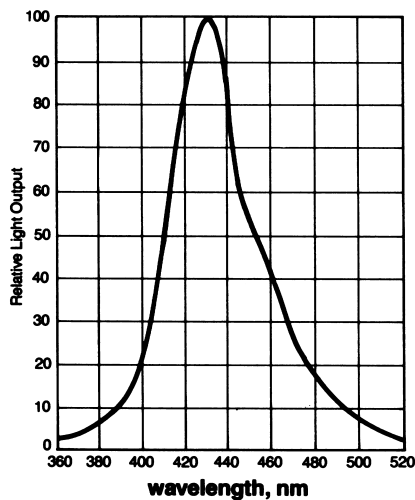
Light Output % Anthracene	60	48	38
Decay Time, ns	2.2	2.2	2.2
Wavelength of Max. Emission, nm	425	425	425
Bulk Light Attenuation Length, cm	120	120	120

Atomic Composition –

No. of C Atoms per cm ³ (x 10 ²²)	4.63	4.43	4.18
No. of H Atoms per cm ³ (x 10 ²²)	5.18	5.18	5.18
No. of ^{10}B Atoms per cm ³ (x 10 ²⁰)	1.12	5.59	11.25
No. of Electrons per cm ³ (x 10 ²³)	3.34	3.33	3.32

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Emission Spectrum –



Linear Attenuation Coefficients for Neutron Capture Scintillator, BC-454 (1% ¹⁰B) * –

Neutron Energy	Cross Section Barns/Atom	Linear Attenuation Coefficient (cm ⁻¹)
0.025 eV	3836.00	2.15
0.1 eV	1929.00	1.08
1.0 eV	610.00	0.34
10 eV	193.00	0.11
100 eV	60.60	0.034
1 keV	19.00	0.011
10 keV	5.89	0.0033
20 keV	4.17	0.0023
30 keV	3.41	0.0019
40 keV	2.98	0.0017
50 keV	2.68	0.0015
100 keV	1.96	0.0011
120 keV	1.80	0.0010
150 keV	1.61	0.00090
200 keV	1.36	0.00076
225 keV	1.28	0.00072
250 keV	1.19	0.00067

*5.6 x 10²⁰ Atoms/cm³ ¹⁰B

References –

1. L.W. Bollinger and G.E. Thomas, *Rev. Sci. Instrum.*, 28, 489-496 (1957)
2. Von L. Sutterlin, *Atomkernenergie*, Vol. 12, NO. 7/8, 287, 228 (1967)
3. L.R. Greenwood and N.R. chellew, *Rev. Sci. Instrum.*, 50 (4), 466-471 (April, 1979)
4. D.M. Drake, et al, *Nucl. Instr. & Methods in Physics Res.*, A274, 576 (1986)

Manufacturer reserves the right to alter specifications.

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