

BORON LOADED LIQUID SCINTILLATOR

EJ-339, EJ-339A, EJ-339A2

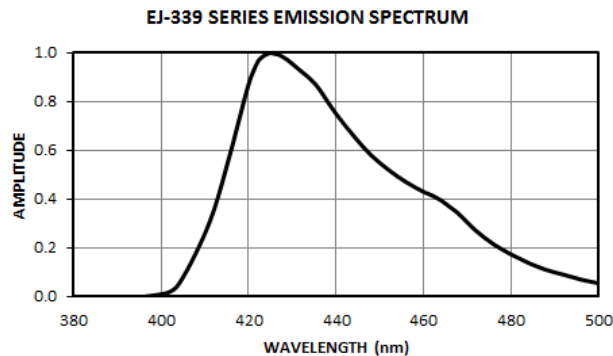
Two standard versions of this boron-loaded liquid are offered. **EJ-339** contains 5% by weight of natural boron and, hence, contains approximately 1% ^{10}B . In **EJ-339A** the same boron loading compound is enriched to 90 atom percent in ^{10}B and therefore contains 4.6% ^{10}B by weight. Other boron loadings are also available, such as **EJ-339A2** with 2.5% ^{10}B by weight.

These scintillators are used for total absorption neutron spectrometry in which the prompt recoil proton pulse from an incoming fast neutron is gated by the boron capture pulse of the same neutron having been thermalized within the scintillator. The $^{10}\text{B}(n,\alpha)^7\text{Li}$ dominant capture reaction has a 2.31 MeV Q-value which produces a scintillation pulse of amplitude equivalent to that of an electron of about 90 keV. A combination of pulse height, pulse shape discrimination, and delayed time gating techniques may be employed to identify the prompt and delayed

neutron pulses from amongst the gamma background. For neutron energies below 200 keV, the capture time constant is solely determined by the ^{10}B concentration and is inversely proportional to it. The average capture time is about 1.4 μs for EJ-339 and 0.3 μs for EJ-339A. The average time to thermalize and capture a 1 MeV neutron is 2.7 μs for EJ-339 and would be proportionally smaller for EJ-339A.

When these scintillators are supplied in metal or glass cells, very small cells or thin cells should be avoided in order to achieve good neutron capture efficiencies. When supplied in bulk, be aware that the liquids are moisture sensitive and must be carefully handled to avoid even the moisture found in air. Also, to assure good pulse shape discrimination properties, the liquids must be encapsulated under appropriate inert gas conditions.

PROPERTIES	EJ-339	EJ-339A	EJ-339A2
^{10}B Content (% w/w)	0.95	4.6	2.5
Light Output (% Anthracene)	65	65	70
Wavelength of Maximum Emission (nm)	425	425	425
Specific Gravity	0.92	0.92	0.92
Refractive Index	1.415	1.415	1.415
Flash Point ($^{\circ}\text{C}$)	-8	-8	-8
H Atoms per cm^3 ($\times 10^{22}$)	5.03	4.98	5.10
C Atoms per cm^3 ($\times 10^{22}$)	2.90	2.87	3.43
O Atoms per cm^3 ($\times 10^{22}$)	0.814	0.802	0.432
^{10}B Atoms per cm^3 ($\times 10^{22}$)	0.053	0.254	0.137



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