

Fig. 1: Examples of typical shapes that can be cast using BSO-100. Scale: the larger Right Circular Cylinder is 2"φ x 2".

Description

BSO-100 is a scintillating mixture of two organic silanes cooled below its glass transition temperature giving it an amorphous (glassy) structure. Hence the name OGS for “organic glass scintillator”.

BSO-100 has several very impressive properties. Its light output exceeds anthracene's, its neutron/gamma discrimination is comparable to stilbene's, its pulse rise and fall times are among the fastest seen among organic scintillators, and it's fairly rad-hard. Details on these values appear below.

The major limitation on BSO-100

applications is its tendency for surface recrystallization, which turns a thin surface layer from clear to white, and appears in response to oils (fingerprints) or greases (coupling compounds) or to elevated temperatures (40 – 50°C). While studies have shown that this transition does not seem to affect light output, timing, or neutron/gamma discrimination, [9] current cautious practice is to coat surfaces epoxy or epoxy/glass to minimize the effect and maintain clarity. In any case the issue is no more difficult to deal with than the common one of protecting NaI(Tl) from moisture.

Properties:

Composition (At. %): At. %: Stilbene: 46.15% H and 53.85% C. OGS: 45.59% C, 53.17% C and 1.24% Si.

General properties: are shown in Table 1, which compares them to other common scintillators. Supporting **Figures 3-8** are shown on the next page.

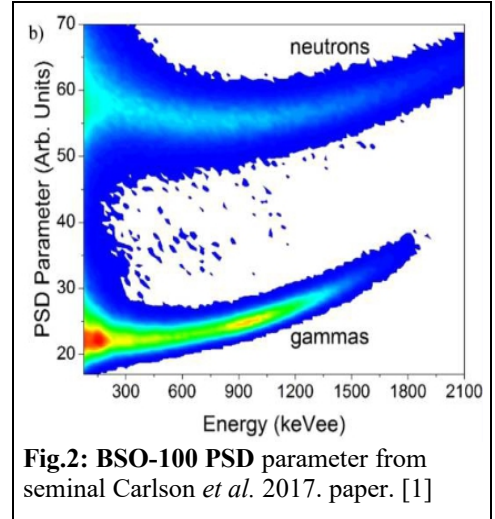


Fig.2: BSO-100 PSD parameter from seminal Carlson *et al.* 2017. paper. [1]

TABLE 1: Property	OGS	Stilbene	BC-404	EJ276	EJ-309
Rise Time (ns) [8], Elijen	0.82	1.01	0.96	0.81	0.7
Decay time (ns) [8]	2.2	5.8	2.7	3.2	3.16
Photons/MeV [3],[8]	20K, 16K	17K, 13K	-, 8K	8K, 6K	13K, 12K
Density (g/cc) [5], data sheets	1.096	1.030	1.023	1.099	.874
CTR (ps) 300 KeVee [2],[8]	270, 200	340, 350	-, 260	-, 350	
ΔE/E (%) @ 477KeV [21],[3]	10, 13	11, --		23-30	11
λ of max emission (nm) [3], [8]	431, 435	383, 380	--, 408	434, 425	433, 425
Neutron detection efficiency (%) [6]	37 & 30	34 & 34			
Index of refraction	1.58	1.63	1.580	1.580	1.510
Softening point (°C)	~ 60	125	70	70	Liquid

Points of caution: 1) PMTs: when employing BSO-100 with PMTs, because it is so bright and fast, it can generate high enough instantaneous currents to cause non-linear outputs. Therefore the PMT type and operating voltage need to be carefully selected and performance tested to obtain optimal results. **2) Table values:** the values presented here depend upon sample geometry, wrapping, PMT, optical coupling, and digitizer at the very least. Careful experimental design and analysis are required to optimize performance.

Radiation hardness: Pinilla-Orjuela *et al.* [5] compared the responses of OGS, stilbene, EJ-276, and EJ-270 to neutron fluences of up to 3×10^{11} and 100 kRad gamma-ray doses. OGS showed minimal changes in either light output or FOM up to the highest doses and room temperature annealing of the small observed changes with a 24 hour time constant.

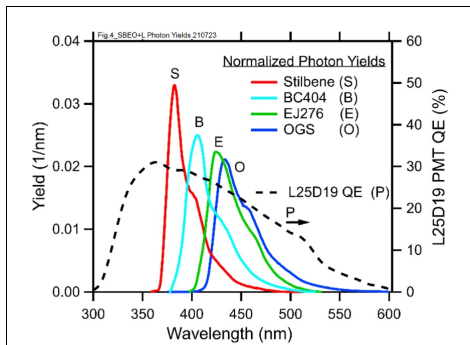


Fig. 3: Light output curves comparing OGS to stilbene, EJ-276, BC-404 and the quantum efficiency of a fast PMT. [8]

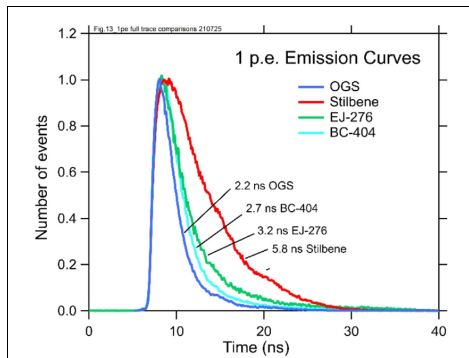


Fig. 4: 1 photoelectron emission curves comparing OGS to stilbene, EJ-276, and BC-404. [8]

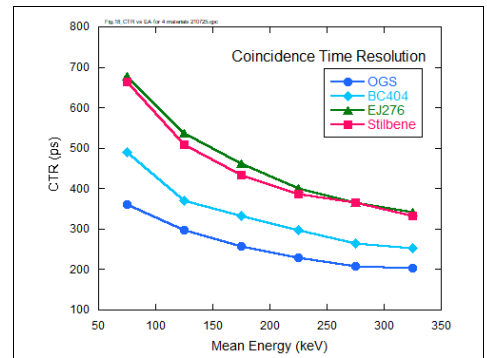


Fig. 5: Coincidence time resolution between 1''x1'' cylinders of OGS, stilbene, Ej-276 and BC-404. [8]

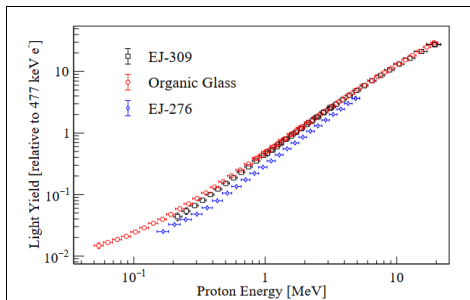


Fig. 6: Light yield versus scattered proton energy in OGS, EJ-309, and EJ-276. [4]

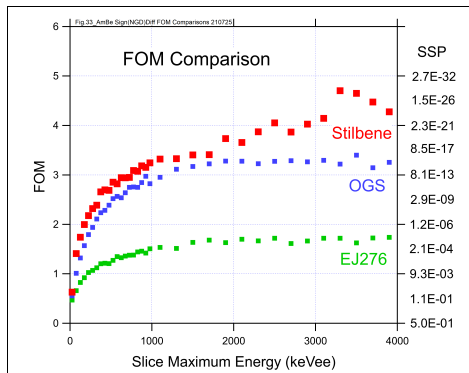


Fig. 7: Figures of merit (FOM) from OGS, stilbene and EJ-276 for 1''φ x 1'' RCCs [8]

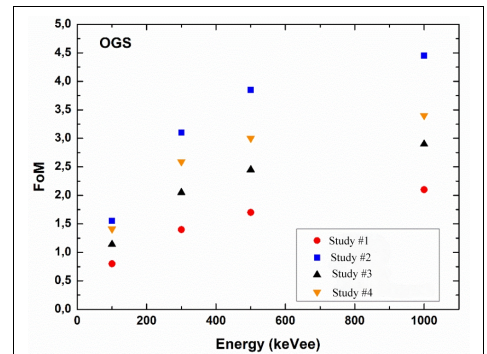


Fig. 8: OGS FOMs versus energy from 4 different studies. [3]

Ordering information and options:

Blueshift Optics currently manufactures BSO-100 scintillators as bars, plates, cylinders, etc. by a casting process wherein we order a master shape machined from aluminum, use it to create silicone molds and then use those to cast the desired parts. The master is reusable and thus only needs to be created once for any given shape. Masters typically cost \$300 – 600. Thus, for a small number of parts there is a definite cost saving by ordering an “existing” shape for which Blueshift already has a master. For larger numbers of parts or when the dimensions are critical to an experiment, then it obviously makes sense to specify the exact shape required and pay a one-time “master fabrication charge”. Our goal is to post existing shapes on our website but a query to info@blueshiftoptics.com will provide the most current prices and allow you to discuss your requirements and request quotations.

As noted earlier, OGS-100 scintillators can be supplied with optically clear coatings of a 250-500 μm of optical epoxy. These must also be cast but the epoxy retains the optical surface quality of its mold. Experience suggests that a “frosted” surface on the scintillator exit window improves light extraction. We can provide this at no added charge. For cases where the exit window will see hard usage (multiple attachments to the sensor) we can epoxy a thin glass or fused silica microscope cover slip to the scintillator provided the size is commercially available. Contact us early in your design process to tap our expertise to help you meet your price and performance goals.

Pricing: Please note that, at the date of this data sheet, website posted prices are significantly higher than our current prices.

Again, query us at info@blueshiftoptics.com for up to date pricing, quotations and delivery times.

Examples: (Qty 1, April 17, 2026) 1''φ x1'' cylinder, epoxy coated: \$375US; 2''φ x2'' cylinder, epoxy coated: \$1,800US.

References to values presented above and experimental measurement techniques:

- [1] J.S. Carlson *et al.*, J. Am. Chem. Soc. **139** (2017) 9621–9626. <https://doi.org/10.1021/jacs.7b03989>.
- [2] N.P. Giha *et al.* NIM-A **1014** (2021) 165676 <https://doi.org/10.1016/j.nima.2021.165676>
- [3] M Grodzicka-Kobylka *et al.* NIM-A, **1047** (2023),167702 <https://doi.org/10.1016/j.nima.2022.167702>
- [4] T.A. Laplace, *et al.* JINST **15** (2020) P11020 <https://doi.org/10.1088/1748-0221/15/11/P11020>
- [5] M.I. Pinilla-Orjuela *et al.* NIM-A, **1053** (2023)168309 <https://doi.org/10.1016/j.nimEEEEa.2023.168309>
- [6] T.H. Shin *et al.*, NIM-A **939** (2019) 36–45. <https://doi.org/10.1016/j.nima.2019.05.036>
- [7] J. Turko *et al.*, JINST **19** (2024) P01008 <https://doi.org/10.1088/1748-0221/19/01/P01008>
- [8] W. K. Warburton *et al.*, NIM-A, **1018** (2021) 165778. <https://doi.org/10.1016/j.nima.2021.165778>
- [9] E.A. Schneider *et al.*, IEEE TNS, **72** (2025) 3830 – 3834. <https://doi.org/10.1109/TNS.2025.3614881>