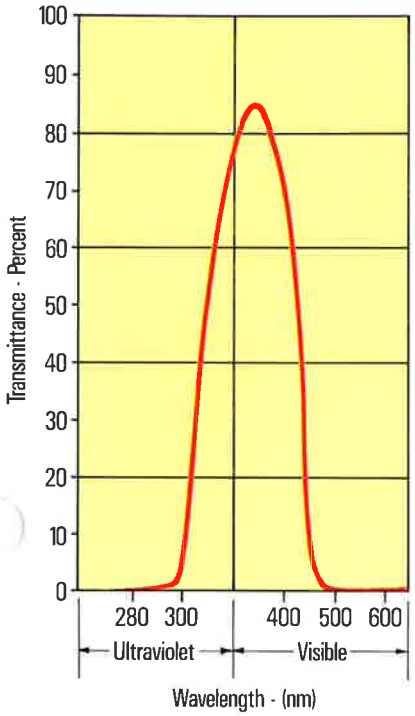
Data Sheet

Product Data Sheet 7610-B
November, 1994

GE Lighting Components



Black Light Systems

The use of ultraviolet light continues to expand as each new generation of designers discovers this unique and versatile medium.

It is capable of creating eye catching psychedelic effects in displays, room decor, and theatrical productions, but it has many practical uses as well. These include immersing metal parts in a fluorescing liquid to reveal otherwise invisible cracks and flaws under the UV lamp. Another is tagging items or individuals with a phosphorescent dye for identification under a UV lamp at a later time.

Black light is also still widely used in insect traps, mining, crime detection, certain types of copy machines and money changers.

One Source

GE Lighting Components is the source for virtually all of the parts and materials required to make lamps used in these systems. Chief among them is Type 539 fluorescent glass tubing, specially developed by GE to create the maximum ultraviolet light. With a minimum of visible light, the glass transmits the near (soft) UV and blocks the far (hard) UV.

This dark colored tubing controls the output of ultraviolet energy in a very narrow band of the UV portion of the spectrum, between 3000 and 4300 angstroms in the case of a .030″ glass wall. The peak is at 3650 angstroms. It can be safely used to illuminate exhibits without creating ozone.

Because of its high lead content (see Table II) Type 539 glass is more workable than competitive grades of black light tubing. This makes it easier to draw down into the smaller diameters required in many of today's designs.

GE Produces Virtually all the Components You Need for Black Light Systems...

Black Light Blue

Most black light sources produce visible light, reducing the level of contrast and making displays less effective. A light absorbing filter is usually used between the black light source and the irradiated surface to seal off the visible light.

To avoid the use of filters, GE Lighting Components Type 539 glass tubing is made from a special filter glass that absorbs virtually all the visible light while transmitting 97 to 98% near ultraviolet energy. For applications in which maximum contrast is desired, in large displays, for instance, this BLB (black light blue) glass is recommended.

Table I - Properties of 539 Glass Tubing

Density	2.91 gm/cc
Expansion	91.5 x 10^{-7}/cm/cm/°C
Softening Point	625°C
Strain Point	395°C
Anneal Point	435°C
Transmission	***@ .035" wall***
3000°A	10% max.
3650°A	80% min.
4300°A	10% max.
Electrical Resistivity	
250°	8.5 $\log_{10}$ ohm x cm
300°	7.9 $\log_{10}$ ohm x cm
350°	6.6 $\log_{10}$ ohm x cm

Table II — Typical Composition of 539 Glass

ELEMENT	%
SiO_2	60.8
AL_2O_3	1.5
Fe_2O_3	0.04
Na_2O	6.9
CaO	0.2
L_2O	0.02
PbO	21.3
Sb_2O_3, K_2O, NiO and Co_2O_4	9.34

GE produces black light fluorescent tubing in a number of standard and custom made diameters ranging from T3 (.375"/9.5mm) to T12 (1.50"/38mm).

Bulb Blanks

For black light systems that require a discharge lamp, GE Lighting offers the "E" shaped bulb blank pictured here. It is available as shown or with a dimple on top. Typical properties of these bulb blanks are shown below:

Table III – Properties of Ultraviolet Glass Bulb Blanks

Mechanical

Density @20°C . . . . . 2.75 g/cm³

Viscosity

Working Point
(10^4 poises) . . . . . 980°C

Softening Point
($10^{7.6}$ poises) . . . . . 665°C

Annealing Point
(10^{13} poises) . . . . . 520°C

Strain Point
(10^{14} poises) . . . . . 480°C

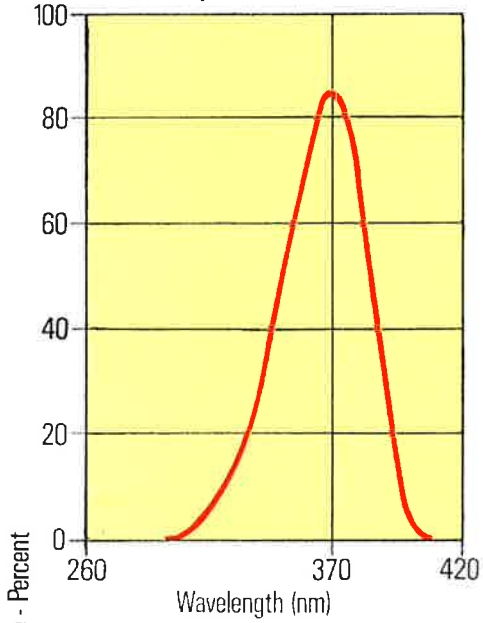
Thermal Expansion

0...300°C . . . . . 97.5 x 10^{-7}/cm/cm/°C

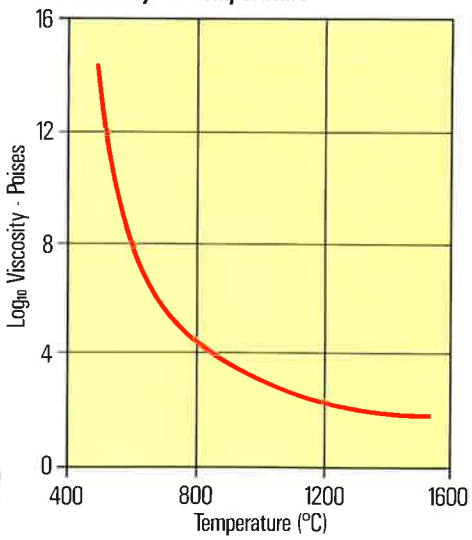
Table IV – Typical Composition of Ultraviolet Bulb Blanks

ELEMENT	%
SiO_2	65.0
Na_2O	11.8
K_2O	4.8
NiO	7.4
B_2O_3	3.3
BaO	4.0
CaO	2.2
Fe_2O_3	0.1 max
MgO, Sb_2O_3, Al_2O_3, and CuO	1.51

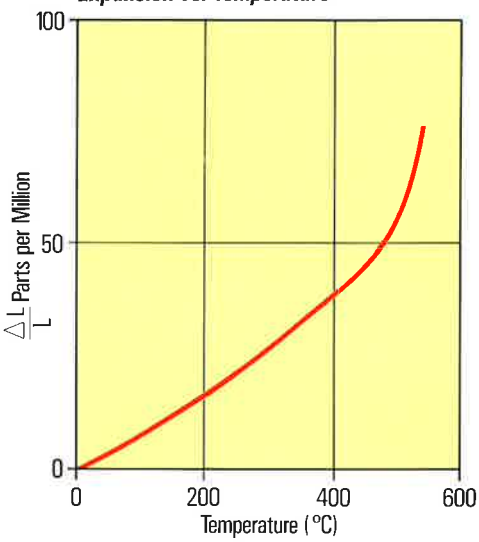
Ultraviolet Spectral Transmittance



Viscosity vs. Temperature



Expansion vs. Temperature



Black Light Phosphor

GE Lighting Components has also developed a UV emitting phosphor, Strontium Europium Borate, that is compatible with lamps made of Type 539 glass tubing and bulbs. It is highly efficient and long lasting, up to 15,000 hours.

SrB_4O_7, activated with the divalent Eu, emits in the ultraviolet with a peak of 368 nanometers when excited by 254 nm radiation. The phosphor is normally supplied as a dry no mill powder that can be mixed in a variety of suspension binder systems. When combined with the BLB glass, this system offers the most efficient source of black light that is available with virtually no visible light radiated.

The high efficiency, excellent maintenance and narrow distribution of the SEB phosphor makes it a clear choice over other UV emitting materials such as the barium disilicates.

GE also manufactures water and lacquer based binder systems which are compatible with the SEB phosphor.

Spectral Energy Distribution

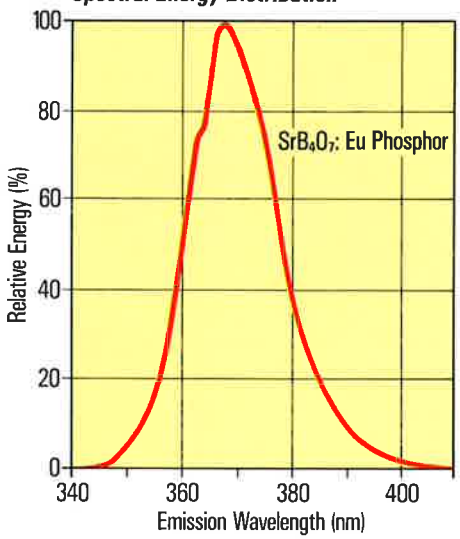


Table V – Standard Particle Size Distribution of SrB_2O_7

Micron Range	*Weight Percent*
0-5	45
5-10	45
10-15	8
Over 15	2
Median Particle Diameter by Coulter Counter	5.4
Fisher Sub-Sieve Sizer Number	2.8

Call GE For All Your Lamp Component Requirements

In addition to lamp envelopes and phosphors, GE Lighting Components supplies the cathodes, bases, lead wires, support wires and formed metal internal parts for black light systems. These products are part of our full line of lamp components, which includes clear fluorescent and incandescent lamp envelopes, pressed glass parts, tungsten and molybdenum wire, lamp filaments and cathodes, Dumet and Cumet wire, lead wires, lamp bases, phosphors and other lamp chemicals. Catalogs and data sheets are available on all products.

For application engineering assistance or ordering information, including terms and conditions of sale, contact your area sales representative or the office listed below.

GE Lighting Components
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