

June 22, 2012

The Hon. Kevin Brady
Chairman, House Ways and Means Subcommittee on Trade
1102 Longworth House Office Building
Washington, DC 20515

The Hon. Jim McDermott
Ranking Member, House Ways and Means Subcommittee on Trade
1102 Longworth House Office Building
Washington, DC 20515

RE: Objection to H.R. 5118 – Phosphor blend of yttrium oxide doped with europium and lanthanum phosphate luminophores

Dear Representatives Brady and McDermott:

Global Tungsten & Powders (GTP) is a US domestic producer of multiple specialty chemicals and refractory powders. GTP has been producing phosphors for nearly 60 years including phosphors for X-RAY, CRT, display, lighting, and backlighting applications. Some of our many phosphors produced in Towanda, Pennsylvania are phosphor blend of yttrium oxide doped with europium and lanthanum phosphate luminophores used in the production of lighting phosphors.

We write today to **object to H. R. 5118**, a Miscellaneous Tariff Bill request from Representative Tim Huelskamp of Kansas's 1st District that would suspend duties on **phosphor blend of yttrium oxide doped with europium and lanthanum phosphate luminophores** for a period of three years.

We do not believe that passage of this bill is in the national interest: removing these duties will threaten American producers of luminescent/fluorescent lighting phosphors, including GTP, by allowing Chinese producers to “dump” material into the US market. This will eliminate competition from US manufacturers, ultimately resulting in a foreign monopoly controlling this phosphor and rare earth material.

GTP is the last active manufacturer at commercial volumes in the US of phosphors for lighting and backlighting applications. GTP has been a world leader in the research and development and manufacture of phosphors for various markets for many decades. In

2011, GTP produced over one million kgs of phosphors and phosphor chemicals of which the majority of these products were sold in the US. GTP products, all manufactured by 1000 American workers in Towanda, Pennsylvania, are used in a wide variety of commercial and residential lighting products. During our long history of manufacturing in Pennsylvania, we have invested hundreds of millions of dollars in our chemical operations, reduction furnaces, powder spray drying capabilities, carburizing furnaces, presses, sintering furnaces, and analytical equipment. But due to extreme increased price pressure from foreign rare earth availability policies and below market priced phosphors, GTP is losing market share.

Our process starts with rare earth oxides and involves many steps that include sifting, blending, chemical washing, filtering, drying, mixing, compounding, and others. Various rare earth oxides, compounds, and co-precipitates are used as the precursors for many of the phosphors we produce: Chinese production and export policies have caused costs for non-Chinese manufacturers to skyrocket, granting Chinese companies the ability to significantly undercut competitors. Today, two more US phosphor manufacturers are in the process of closing down their operations because of this anticompetitive practice.

Phosphors are used in the production of fluorescent lamps, plasma TVs, LEDs, and electroluminescent products. In recent years, increasing imports of phosphors and phosphor compounds from China, priced at unsustainably low levels, have created price erosion in the US market. If a duty suspension is granted, continued Chinese dumping threatens to force the few remaining US manufacturers, including GTP, to discontinue their phosphor operations and potentially leave the industry altogether. The continued success of our phosphor operations is of great importance to GTP's future, and maintaining competitive pricing and market share of these materials are key components in this strategy.

Additionally, the relaxation of duties will deprive the federal government of significant revenues, all collected from foreign manufacturers. Many of the compounds/phosphors used as a luminophores are all grouped and imported under the HTS subheading 3206.50.00 making it impossible to break out the individual values from the USITC website. Therefore, GTP will only reference the total duties the US Government collects as it relates to all phosphors imported in 2011 under this heading.

Based on 2011 US import data as reported by USITC, the customs value of imports of inorganic products of a kind used as luminophores were \$39,727,452, of which \$21,597,655 (54%) were imported from Japan and \$13,474,822 was imported from China (35%) the majority of which are lighting phosphors. Calculated duties were \$4,545,938, of which Japanese importers were responsible for \$1,403,854 and Chinese importers were responsible for \$875,867. As you know, suspension of the duty at this level would significantly exceed the annual "PAYGO" type of limitations that are normally suggested by the CBO. In addition, there would be lost tax revenues on sales as imports of these phosphors take more US market share.

The products that are included under this subheading are:

9902.22.63 / Yttrium oxide phosphor, activated by europium of a kind used as a luminophore (CAS No. 68585-82-0) (provided for in subheading 3206.50.00).

9902.22.64 / Compound of barium magnesium aluminate phosphor, activated by europium or manganese, of a kind used as luminophores (CAS Nos. 63774-55-0 and 1308-96-9) (provided for in subheading 3206.50.00).

9902.22.65 / Yttrium vanadate phosphor, of a kind used as a luminophore (CAS No. 6874-82-7) (provided for in subheading 3206.50.00).

9902.22.66 / Compound of strontium chloroapatite-europium, of a kind used as a luminophore (CAS No. 68784-77-0) (provided for in subheading 3206.50.00).

9902.22.67 / Phosphor of zinc silicate, of a kind used as a luminophore (CAS No. 68611-47-2) (provided for in subheading 3206.50.00).

9902.22.68 / Strontium magnesium phosphate-tin doped inorganic products of a kind used as luminophores (CAS Nos. 1314-11-0, 1314-56-3, 1309-48-4, and 18282-10-5) (provided for in subheading 3206.50.00).

9902.22.69 / Yttrium oxide phosphor, activated by europium used as a luminophore (CAS No. 68585-82-0) (provided for in subheading 3206.50.00).

9902.22.70 / Calcium chloride phosphate phosphor activated by manganese and antimony used as a luminophore (CAS No. 75535-31-8) (provided for in subheading 3206.50.00).

9902.22.72 / Calcium chloride phosphate phosphor used as a luminophore (CAS No. 75535-31-8) (provided for in subheading 3206.50.00).

9902.22.73 / Strontium halophosphate doped with europium used as a luminophore (CAS Nos. 109037-74-3 and 1312-81-8) (provided for in subheading 3206.50.00).

9902.22.74 / Small particle calcium chloride phosphate phosphor activated by manganese and antimony used as a luminophore (CAS No. 75535-31-8) (provided for in subheading 3206.50.00).

9902.22.75 / Lanthanum phosphate phosphor, activated by cerium and terbium, inorganic used as luminophores (CAS Nos. 13778-59-1, 13454-71-2, and 13863-48-4 or 95823-34-0) (provided for in subheading 3206.50.00).

During the past 24 months, GTP has invested over \$4 million dollars of capital equipment in a new facility to recycle and recover rare earth metals from phosphor secondary raw materials separated from discarded lamps. This operation will help in offsetting the costs of importing rare earth oxides, allowing GTP to be more cost competitive and proactive leading the way for recycling lamps in the US. GTP has years of experience of running chemical operations and recycling tungsten scrap and is applying that ingenuity and expertise to this operation.

A removal of the duty could shift volume from US producers to more imports from China, threatening the economic rationale for this investment. Clearly, the maintenance of the current US duty rate is important for the continued viability of GTP and might encourage our customers to buy US made phosphors as opposed to foreign produced. Decreasing, suspending, or extending an existing suspension of a US duty will encourage more imports to displace domestic market share, thereby negatively affecting any new investments in the US phosphor and lamp industry, including GTP's Towanda facility.

As you are well aware, Miscellaneous Tariff Bill requests are usually only granted if they are “noncontroversial,” including no domestic production. Because GTP and other US manufacturers are engaged in phosphor production, H.R. 5118 does not meet this requirement, and we urge you to remove phosphor blend of yttrium oxide doped with europium and lanthanum phosphate luminophores from the Miscellaneous Tariff Bill package.

In order to inform all parties of our objection, we will also send copies of this letter to the Department of Commerce and the U.S. International Trade Commission. Please do not hesitate to contact Paul Sedor of GTP in our Towanda, PA offices at (570) 268-5105 or Jeff Green of Green & Company, at their Washington, DC offices at (202) 546-0388 if you have any questions.

Sincerely,

A handwritten signature in cursive script that reads "Stacy Garrity".

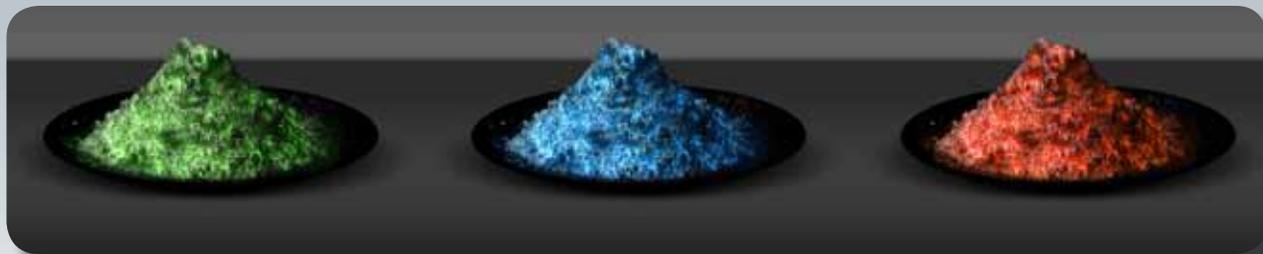
Stacy Garrity
Director Sales and Marketing
Global Tungsten & Powders
(570) 268-5175

Attachment: GTP brochure

Cc: Ms. Allison Giles, Majority Staff Director
Representative Tom Marino

Phosphors and Chemical Reference Guide

14th Edition



Global Tungsten & Powders (GTP) is a world leader in powder technology, high temperature metallurgy, and inorganic chemistry. In addition to being the world's largest producer of tungsten and molybdenum chemicals and powders, GTP consistently develops and manufactures high quality phosphors for a wide range of applications:

Phosphors for Lighting Applications: Fluorescent, light-emitting diode (LED), electroluminescent (EL), sun tanning, neon, high pressure mercury vapor, germicidal, and photocopiers.

Phosphors for Display Applications: Fluorescent, LED, and EL phosphors for backlighting displays and as the direct light source in emissive displays.

Phosphors for Tagging and Identification for security needs.

On site research and development ensures continuing new product developments, complimented by ongoing technical support and advanced analytical services.

A global marketing presence ensures convenient communication between our customers and the manufacturing and research facilities. Our ISO 9001 certification and our compliance with ISO 14001 reflect the company's commitment to total quality and to the environment. This reference list briefly describes the inorganic phosphor powders and related chemicals that are available from GTP.

Products are identified by a GTP type number and arranged in sections according to general application: a type may appear in more than one section. Each section highlights important material characteristics such as chemical formula, emission color, peak wavelength, particle size, and application detail.

The description of each type includes the appropriate material symbol. Activator elements are preceded by a colon (:), and blend components are separated by a semicolon (;) or a slash (/).

"Technical Information Bulletins" (TIBs) provide more comprehensive information on each product and are available upon request.



Phosphors for Fluorescent and Neon Lamps

GTP Type	Chemical Formula	Emission Color	Peak (nm)	50% Bandwidth (nm)	50% Size (µm)	Notation
2196	BaMgAl ₁₆ O ₂₇ :Eu:Mn	blue-green	456, 514	50	25	BAM:Mn
2212	(La,Ce,Tb)PO ₄ :Ce:Tb	green	546	6	8.5-10.5	LAP
2213	(La,Ce,Tb)PO ₄ :Ce:Tb	green	546	6	6.5-8	LAP
2216	(La,Ce,Tb)PO ₄ :Ce:Tb	green	546	6	4-5.5	LAP
2217	(La,Ce,Tb)PO ₄ :Ce:Tb	green	546	6	10.5-13	LAP
2218	(La,Ce,Tb)PO ₄ :Ce:Tb	green	546	6	3-4	LAP
2219	(La,Ce,Tb)PO ₄ :Ce:Tb	green	546	6	6.5-8	LAP, low activator
2230	GdMgB ₅ O ₁₀ :Ce,Tb	green	542	9	6.5-8	CBT
2283C	Zn ₂ SiO ₄ :Mn	green	528	40	2-4	willemite
2284C	Zn ₂ SiO ₄ :Mn	green	528	40	1-3	willemite
2285C	Zn ₂ SiO ₄ :Mn	green	528	40	14-18	willemite
2286C	Zn ₂ SiO ₄ :Mn;Sb ₂ O ₃	green	528	40	14-18	willemite
2291	(Ce,Tb)MgAl ₁₁ O ₁₉ :Ce:Tb	green	546	9	10-12	CAT
2297	(Ce,Tb)MgAl ₁₁ O ₁₉ :Ce:Tb	green	546	9	7-9	CAT
2301	MgWO ₄	blue	473	118	3.5-8	
2341	(Y,Eu) ₂ O ₃ :Eu	red	611	4	10.5-13	YOE, Eu ₂ O ₃ 6.5%
2342	(Y,Eu) ₂ O ₃ :Eu	red	611	4	6.5-8	YOE, Eu ₂ O ₃ 6.5%
2343	(Y,Eu) ₂ O ₃ :Eu	red	611	4	8.5-10.5	YOE, Eu ₂ O ₃ 6.5%
2344	(Y,Eu) ₂ O ₃ :Eu	red	611	4	4-5.5	YOE, Eu ₂ O ₃ 6.5%
2345	(Y,Eu) ₂ O ₃ :Eu	red	611	4	6.5-8.5	YOE, Eu ₂ O ₃ 5.3%
2347	(Y,Eu) ₂ O ₃ :Eu	red	611	4	6.5-8.5	YOE, low activator
2348	(Y,Eu) ₂ O ₃ :Eu	red	611	4	6.5-8.5	YOE, Eu ₂ O ₃ 4.0%
236	Mg ₄ (F)GeO ₆ :Mn	red	658	17	14-22	germanate
2363	Mg ₄ (F)GeO ₆ :Mn	red	658	17	3-5	germanate
2364	Mg ₄ (F)(Ge,Sn)O ₆ :Mn	red	658	17	5-8.5	germanate
2402	CaWO ₄ :Pb	blue	433	111	35-35	
2412	CaWO ₄ :Pb	blue	446	112	15-32	
242	(Ba,Ti) ₂ P ₂ O ₇ :Ti	blue-green	494	143	11-14	
243	Sr ₂ P ₂ O ₇ :Sn	blue	460	98	9.5-13	
2451	Sr ₅ F(PO ₄) ₃ :Sb:Mn	blue-green	509	127	8.5-13	
246	(Ba,Mg) ₂ Al ₁₆ O ₂₇ :Eu	blue	450	49	16-26	tri-phosphor, BAM
2461	(Ba,Mg) ₂ Al ₁₆ O ₂₇ :Eu	blue	450	52	10.5-19	tri-phosphor, BAM
2462	(Ba,Mg) ₂ Al ₁₆ O ₂₇ :Eu	blue	450	52	6-7.5	BAM, low activator
2464	(Ba,Mg) ₂ Al ₁₆ O ₂₇ :Eu	blue	450	52	6-7.5	BAM
2466	(Ba,Mg) ₂ Al ₁₆ O ₂₇ :Eu	blue	450	52	4-5	BAM
2467	BaMgAl ₁₀ O ₁₇ :Eu	blue	450	52	6-7.5	SBAM (modified BAM)
2468	BaMgAl ₁₀ O ₁₇ :Eu	blue	450	52	4-5	SBAM (modified BAM)
2469	BaMgAl ₁₀ O ₁₇ :Eu	blue	450	52	11-13	SBAM (modified BAM)
247	Sr ₅ Cl(PO ₄) ₃ :Eu	blue	447	32	6-12	SCAP
2471	(Sr,Ba,Mg,Ca) ₅ Cl(PO ₄) ₃ :Eu	blue	447	37	5-9	SECA (modified SCAP)
248	Sr ₆ P ₅ BO ₂₀ :Eu	blue-green	480	82	8-10	

Particle size measurements are dependent on sample preparation and measurement system parameters. Please contact GTP to discuss your particle size requirements.



Phosphors for Fluorescent and Neon Lamps (Continued)

GTP Type	Chemical Formula	Emission Color	Peak (nm)	50% Bandwidth (nm)	50% Size (µm)	Notation
281	(Ca,Zn,Mg) ₃ (PO ₄) ₂ :Sn	orange	610	146	9-16	
282	(Sr,Mg) ₃ (PO ₄) ₂ :Sn	orange	626	120	7-17	
283	(Sr,Mg) ₃ (PO ₄) ₂ :Sn	orange	626	119	8.5-11	
290C	CaSiO ₃ :Pb:Mn	orange	615	83	10-15	

Phosphors for Fluorescent Blends

GTP Type	Blend Component	Blend Name	Color Temp (K)	Emission lamp x	Emission lamp y	32T8 Lamp CRI
5460	4450/2440	Daylight	5000	0.348	0.364	N/A
5461	4450/2440	Daylight	5200	0.341	0.359	N/A
5463	2440/4453	Daylight	5200	0.340	0.362	N/A
5642	4450/2440/4300	Daylight	5600	0.330	0.346	N/A
5650	4450/2440	Daylight	6500	0.314	0.343	N/A
5651	4450/2440/4380	Daylight	6400	0.312	0.348	N/A
5652	4450/2440	Daylight	6500	0.319	0.345	N/A
5653	2440/4453	Daylight	6500	0.319	0.347	N/A
5654	4450/2440	Daylight	6200	0.317	0.343	N/A
6270	2342/2212	Homelight Deluxe	2700	0.464	0.418	84.6
6310	2342/2212/2461	Warm White Deluxe	3000	0.442	0.405	85.2
6350	2342/2212/2461	White	3500	0.414	0.393	85.5
6400	2342/2212/2461	Cool White Deluxe	4000	0.382	0.384	83.7
6403	2345/2212/2471	Cool White Deluxe	4000	0.382	0.384	84.2
6500	2342/2212/2461		5000	0.346	0.352	84.9
6550	2342/2212/2461		5500	0.332	0.348	82.2
6650	2342/2212/2461	Daylight Deluxe	6500	0.313	0.337	79.7
6653	2345/2212/2471	Daylight Deluxe	6500	0.313	0.337	80.1
7204	283/2285C/4990		2000	0.353	0.362	86.6
7273	2212/2345		2700	0.503	0.398	82.6
7300	4350/282/2285C	Deluxe Warm White	3000	0.440	0.402	74.0
7310	283/2451/2285C		3000	0.436	0.382	84.3
7360	283/4490/2285C	Natural White	3600	0.389	0.360	89.0
7400	283/4490/2285C	Deluxe Cool White	4050	0.376	0.368	89.0
7430	4300/2440/2285C	Universal White	4300	0.384	0.377	65.2
7450	4300/282/242	Deluxe Cool White	4200	0.392	0.368	83.2
7471	2212/4450		4700	0.364	0.422	56.3
7500	2451/283		5000	0.346	0.360	90.0
7510	4450/4990/243	Arctic White	5100	0.343	0.359	68.4
7580	2440/283/2285C/2011C		5800	0.326	0.347	90.0
7620	2451/283/2440	Deluxe Daylight	6200	0.316	0.346	89.9
7680	283/2451/2461		6800	0.314	0.308	95.5
7790	2212/2342/2461		7900	0.324	0.307	87.5

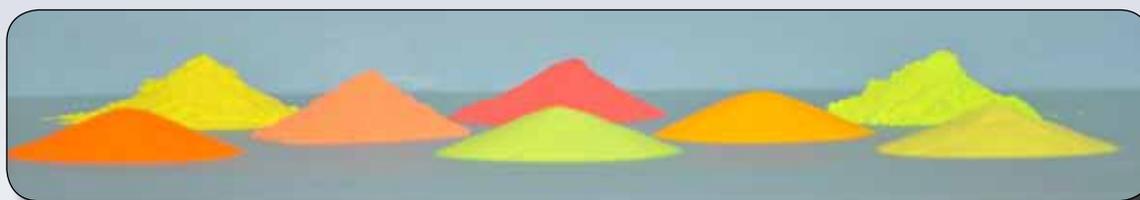
Notes: GTP can match any commercially available blend or provide unique custom blends upon request.

LED Phosphors

GTP Type	Standard / High Bright	50% Size Micron	CIE Color Coordinates x (+/-0.015) y (+/-0.020)		Excitation Range (nm)	Emission Peak (nm) *
9800	High Bright	13-18	0.431	0.549	450-470	537
9801	Standard	6-12	0.431	0.549	450-470	537
9802	High Bright	13-18	0.444	0.540	450-470	543
9803	Standard	6-12	0.444	0.540	450-470	543
9804	High Bright	13-18	0.470	0.519	450-470	554
9805	Standard	6-12	0.470	0.519	450-470	554
9806	High Bright	13-18	0.492	0.498	450-470	562
9807	Standard	6-12	0.492	0.498	450-470	562

GTP can customize color coordinates, particle size, and emission peaks to meet the unique needs of our customers.

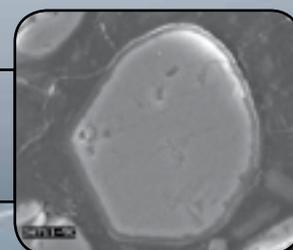
* Emission peak measurement is affected by instrument setting



Phosphors for UV-Emitting Lamps and Photocopy

GTP Type	Chemical Formula	Emission Peak (nm)	50% Band-width (nm)	particle size, d50	Notation
2011C	BaSi ₂ O ₅ :Pb	351	38	10-13	medical/photocopy/blacklight/suntan
GS201X	BaSi ₂ O ₅ :Pb	351	38	10-13	medical/photocopy/blacklight/suntan
2030	(Y,Gd)MgB ₅ O ₁₀ :Ce,Pr	312	3	8-12	medical
2040	(Y,Ce)PO ₄ :Ce	335, 355	16	10-12	suntan
2052	SrB ₄ O ₇ :Eu	371	18	9.5-12.5	photocopy/blacklight/suntan
2055	SrB ₄ O ₇ :Eu	371	18	9.5-12.5	photocopy/blacklight/suntan
2080	(La,Ce)PO ₄ :Ce	316, 335	39	6-8.5	suntan
2090	(CeMg)SrAl ₁₁ O ₁₈ :Ce	338	53	8-12	medical/suntan
2091	(CeMg)BaAl ₁₁ O ₁₈ :Ce	342	53	8-12	medical/suntan
2092	(CeMg)BaAl ₁₁ O ₁₈ :Ce	344	59	11-16	medical/suntan
2093	(CeMg)BaAl ₁₁ O ₁₈ :Ce	347	53	8-13	medical/suntan
2096	MgSrAl ₁₀ O ₁₇ :Ce	307	38	10-16	medical/suntan
2162	Sr ₂ P ₂ O ₇ :Eu	420	29	8.5-15	photocopy (small size)
Ultraviolet ranges defined:		UVC, nm	UVB, nm	UVA, nm	Particle size measurements are dependent on sample preparation and measurement system parameters. Please contact GTP to discuss your particle size requirements.
Europe		280 - 314	315 - 400		
USA (FDA)		200 - 260	260 - 320	321 - 400	

GTP has pioneered phosphor encapsulation processes such as chemical vapor deposition (CVD) and atomic layer deposition (ALD). When our coatings are applied to phosphors the critical characteristics of the material are significantly improved. If you have a phosphor or similar powder that may benefit from a protective coating, please contact us.



Electroluminescent Phosphors

GTP Type	Description	Emission Color	50% Size (µm)	Chromaticity ⁽¹⁾		24 hour luminance ⁽²⁾		Maintenance ⁽³⁾ %	Half-life Hours
				x	y	cd/m ²	ft-L		
GG510	Economy	orange	22-29	0.539	0.451	10.7	3.1	80	800
GG512	Standard	orange	22-29	0.539	0.451	13.3	3.9	85	1000
GG13/14	High Brite	orange	24-33	0.539	0.451	18.6	5.4	85	1000
GGL11	Long Life	orange	25-32	0.539	0.451	12.7	3.7	95	2400
GG520	Economy	blue green	22-29	0.168	0.375	47.3	13.8	85	1000
GG522	Standard	blue green	22-29	0.168	0.375	57.2	16.7	90	1200
GG23/24	High Brite	blue green	24-33	0.168	0.375	69.4	20.3	90	1300
GG25	Super High Brite	blue green	24-33	0.170	0.387	76.9	22.5	90	1300
GGL21	Long Life	blue green	25-32	0.168	0.375	49.4	14.4	95	2400
GG540	Economy	green	22-29	0.172	0.449	47.7	13.9	85	2000
GG542	Standard	green	22-29	0.172	0.449	60.8	17.8	90	2300
GG43/44	High Brite	green	24-33	0.172	0.449	73.9	21.6	90	2600
GG45	Super High Brite	green	24-33	0.170	0.459	82.3	24.0	90	2600
GGL41	Long Life	green	25-32	0.172	0.449	52.8	15.4	95	3600
GG560	Economy	blue	22-29	0.158	0.201	18.5	5.4	70	350
GG562	Standard	blue	22-29	0.158	0.201	29.6	8.6	75	400
GG63/64	High Brite	blue	24-33	0.158	0.201	39.4	11.5	75	450
GG65	Super High Brite	blue	24-33	0.161	0.221	49.2	14.4	75	450
GGL61	Long Life	blue	25-32	0.158	0.201	19.8	5.8	85	1150
GG570	Economy	white	22-29	0.327	0.350	19.9	5.8	80	1000
GG572	Standard	white	22-29	0.327	0.350	23.7	6.9	85	1200
GG73/74	High Brite	white	24-33	0.327	0.350	29.2	8.5	85	1400
GGL71	Long Life	white	25-32	0.327	0.350	21.7	6.3	95	2500
GG84	High Brite	white	22-29	0.275	0.365	40.0	11.7	85	1500

Notes:

(1) Chromaticity values at 24 hours: X +/-0.015, y +/-0.020

(2) Photometric values from typical screen printed test lamps operated at 100V, 400Hz, 70° F, and 50% RH

(3) % maintenance = 100% x 100 hour luminance ÷ 24 hour luminance



Phosphors for High Pressure Mercury Vapor

GTP Type	Chemical Formula	Emission Color	Emission Peak	50% Bandwidth (nm)	50% Size (µm)
236	Mg ₄ (F)GeO ₆ :Mn	red	658	14	14-22
2363	Mg ₄ (F)GeO ₆ :Mn	red	658	14	3-5
2364	Mg ₄ (F)(Ge,Sn)O ₆ :Mn	red	658	16	5-8.5
2390	YVO ₄ :Eu	red	619	1	6.5-11
2391	YVO ₄ :Eu	red	619	1	2-5
GS2391	YVO ₄ :Eu	red	619	1	2-5
283	(Sr,Mg) ₃ (PO ₄) ₂ :Sn	orange	627	138	8.5-11

2391 is available with a variety of coatings and coating thicknesses, Types 2391V, 2391M



Chemicals

Chemical Name	Type / Grade	Symbol	Application
Borate, calcium	frit	(Ca,Ba)O-B ₂ O ₃ -P ₂ O ₅	Improve phosphor adherence to glass in fluorescent lamps
Carbonate, ammonium bi-	luminescent	(NH ₄)HCO ₃	High purity chemicals and phosphor synthesis
Carbonate, barium	low chloride & sulfate	BaCO ₃	High purity chemicals and phosphor synthesis
Carbonate, calcium	luminescent	CaCO ₃ (Calcite)	High purity chemicals and phosphor synthesis
Carbonate, strontium	luminescent	SrCO ₃	High purity chemicals and phosphor synthesis
Carbonate, triple	C3L	(Ba,Sr,Ca)CO ₃	Emissive coating for light source coatings
Carbonate, triple	C4	(Ba,Sr,Ca)CO ₃	Emissive coating for light source coatings
Carbonate, triple	C10	(Ba,Sr,Ca)CO ₃	Emissive coating for light source coatings
Dioxide, zirconium	8000	ZrO ₂	2.0-3.5 FSSS; cathode, lamp-reflector coatings, refractory
Dioxide, zirconium	8002	ZrO ₂	1.0-2.0 FSSS; white body color; cathode. Lamp-reflector coatings; refractory
Fluoride, calcium	luminescent	CaF ₂	High purity chemicals and phosphor synthesis
Phosphate, strontium hydrogen	luminescent	SrHPO ₄	High purity chemicals and phosphor synthesis
Phosphate, barium hydrogen	luminescent	BaHPO ₄	High purity chemicals and phosphor synthesis
Sulfide, zinc	P-200 / optical	ZnS	Infrared lenses
Basing cement	BC1631	CaCO ₃	Base sealer for lamps
Basing cement	BC1631A	CaCO ₃	Base sealer for lamps
Basing cement	BC1700	CaCO ₃ / Noble Metal	Base sealer for TCLP/RCRA compliant lamps
Basing cement	BC1750	CaCO ₃ / Noble Metal	Base sealer for TCLP/RCRA compliant lamps
Basing cement	BC1800	CaCO ₃ / Noble Metal	Base sealer for TCLP/RCRA compliant lamps

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- Dedicated Technical Support
- In-house R&D