PHOSPHORESCENT PIGMENTS

The classic “glow in the dark” or phosphorescent pigments consist of very fine crystals of zinc sulfide doped with copper (ZnS:Cu). The glow is due to the unique properties of crystalline zinc sulfide. Copper is added to the zinc sulfide as an activator. This allows the crystals to absorb light and slowly emit it over time. This slow emission is called phosphorescence.

Products:

UMC Phosphorescent pigments, in addition to the natural colors, are available in a range of daylight fluorescent colors. All of UMC’s phosphorescent materials are non-toxic and non-radioactive. Our product range is as follows:

<table>
<thead>
<tr>
<th>Daylight Body Color</th>
<th>Product Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural (Green emitting)</td>
<td>6SSU</td>
</tr>
<tr>
<td>Yellow</td>
<td>GSS 205/1</td>
</tr>
<tr>
<td>Orange-Yellow</td>
<td>GSS 207/1</td>
</tr>
<tr>
<td>Orange</td>
<td>GSS 305/1</td>
</tr>
<tr>
<td>Rose</td>
<td>GSS 507/1</td>
</tr>
<tr>
<td>Green</td>
<td>GSS 905/1</td>
</tr>
<tr>
<td>Blue</td>
<td>GSS 8B/1</td>
</tr>
<tr>
<td>Natural (Yellow emitting)</td>
<td>GSR</td>
</tr>
<tr>
<td>Orange (Orange emitting)</td>
<td>GSR 115/2</td>
</tr>
</tbody>
</table>

*The body colors of Standard Series and Heat Resistant Series are not exact matches.

GSR is a recently introduced yellow emitting (glowing) pigment also consisting of very fine crystals of zinc sulfide. GSR is activated with small quantities of copper and manganese bound in the molecule, causing the “glow in the dark color” to shift to yellow. The major application of GSR is as a base pigment to effectively improve the “glow in the dark” emitting colors of yellow and orange daylight colored phosphorescent pigments. For example, GSR 115/2 Orange which has a bright orange after glow has been especially developed for Halloween. GSR 115/2 Orange is shaded with a heat resistant fluorescent pigment so it can be used for plastics as well as general ink or coating applications.

So how long does it glow?

After glow depends on the

- Particle size
- Excitation light source & intensity
- Pigment concentration & film thickness.

The glow from 6SSU will be perceptible to dark adapted eyes for four to ten hours after the removal of the light source.

The colored GSS Series pigments will not glow as brightly or for as long as 6SSU. The best performance is attained if the material is excited with a light source rich in UV. For example, black light will be roughly twice as effective as a standard tungsten filament incandescent lamp.

Applications:

UMC’s phosphorescent pigments may be used in all types of paint, powder coatings, silkscreen inks, enamels and plastics.

Some typical applications are:

- Warning and exit signs
- Fire fighting & mining safety gear
- Silkscreen printing on textiles and posters
- Toys and novelties
- Paper and Film Coating
- Fishing Lures
- Craft paints
For optimum performance the following suggestions should be useful:

**Paints & Inks:**
- Use a transparent vehicle with neutral or alkaline pH.
- Plan on using at least 20% pigment loading.
- To minimize settling use a viscous vehicle.
- Apply a white base coat under the phosphorescent layer.
- Apply a clear overcoat containing a UV absorber (we recommend an oxalanilide type) to protect the pigment and improve gloss.
- All additives should be free of heavy metal compounds.

Although UMC’s phosphorescent pigments are extremely stable, there are a number of things to avoid:

- Do not grind or mill the pigment. Breaking down the crystals will destroy the afterglow.
- Avoid exposing the pigment to strong acids or heavy metal compounds. They will react and destroy the glow.
- These pigments are not recommended for prolonged outdoor applications. Sunlight and weather will cause the pigment to slowly decompose.

If you are looking for a phosphorescent pigment with excellent light and weather fastness, that has an afterglow 10 times brighter and longer (at equivalent loadings), please contact us and ask for **LumiNova**\(^\circ\) (patented).

### Physical properties

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CHEM COMP.</th>
<th>BODY COLOR</th>
<th>EMISSION COLOR</th>
<th>EMISSION PEAK (nm)</th>
<th>SPECIFIC GRATIVITY</th>
<th>AV. PART. SIZE (µm)</th>
<th>BRIGHTNESS OF AFTERGLOW (mcd/m(^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 min</td>
</tr>
<tr>
<td>6SSU</td>
<td>ZnS:Cu</td>
<td>Greenish</td>
<td>Green</td>
<td>529 ± 4</td>
<td>4.1</td>
<td>22 ± 3</td>
<td>300</td>
</tr>
<tr>
<td>GSR</td>
<td>ZnS:Cu</td>
<td>Greenish</td>
<td>Yellow</td>
<td>520 &amp; 570</td>
<td>4.1</td>
<td>22 ± 3</td>
<td>150</td>
</tr>
<tr>
<td>GB-U</td>
<td>ZnS:Cu</td>
<td>Greenish</td>
<td>Green</td>
<td>529 ± 4</td>
<td>4.1</td>
<td>13 ± 2</td>
<td>260</td>
</tr>
</tbody>
</table>

**Plastics:**
- UMC’s pigments are compatible with acrylcs, polyesters, epoxies, PVC, propylene and polyethylenes (HDPE, LDPE, etc.).
- Material can be cast, dipped, coated, extruded or molded.
- Use only clear plastics.
- Plan on using 20% to 50% pigment loadings.

For further information, please contact:

**UMC**

UNITED MINERAL & CHEMICAL CORPORATION
1050 Wall Street West, Lyndhurst, N.J. 07071
Telephone:(201) 507-3300  (201) 507-1506
E-mail: inquiry@umccorp.com  Web Site: www.umccorp.com

The information herein is believed to be reliable and is to assist customers in determining whether our products are suitable for their applications. However, no warranty, express or implied, is made as to its accuracy or completeness and none is made as to fitness of this material for any purpose. Our products are intended for sale to industrial and commercial customers. We request that customers inspect and test our products before use and satisfy themselves as to contents and suitability. Nothing herein shall constitute any other warranty, express or implied, including any warranty of merchantability or fitness, nor of protection from any law or patent to be inferred. All patent rights are reserved. The exclusive remedy for all proven claims is replacement of our materials and in no event shall we be liable for special, incidental or consequential damages. We shall not be liable for damages to person or property resulting from its use. Consult the Material Safety Data Sheet for additional information.