LUMILUX®
INDUSTRIAL PIGMENTS

Honeywell

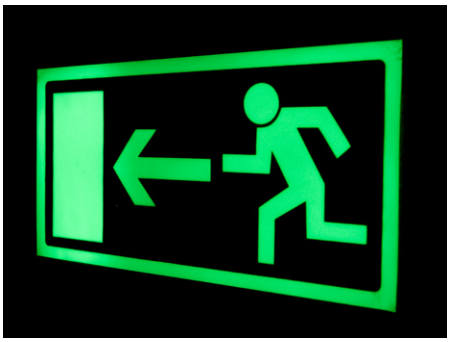
PROCESSING INSTRUCTIONS

The light emission properties of inorganic luminescent pigments are closely linked to their crystal structure. To sustain brightness, the crystal structure must remain intact. Therefore, destruction by mechanical forces, such as grinding or high shear force, should be avoided.

Thermoplastics and Duroplastics

Customers should follow the polymer manufacturer's guidelines for processing in plastic materials.

In addition, the following instructions offer general recommendations on incorporating long afterglow pigments into polymers to achieve perfect brightness and afterglow properties in the end product.



Typical Concentrations of Afterglow Pigments in Polymers

The afterglow brightness depends on the concentration and the grade of pigment used. The higher the concentration of the afterglow pigment in the plastic article, the more intense will be the afterglow effect.

- High-end applications (e.g., safety systems): The pigment loading has to meet the requirements of brightness and afterglow duration. The loading could range from 10% to 30% by weight, with up to 30 recommended for the Lumilux® N grades and up to 15% for SN grades.
- Effect and artistic applications (e.g., toys): The loading can be lower. It is 10% by weight for the Lumilux N grades and 3 to 5% for the Lumilux SN grades.

Requirements for Highly Transparent Plastics

Only highly transparent and colorless polymers will ensure satisfactory afterglow brightness in end products. Colored polymers would cause light emitted by the pigments to be absorbed or scattered, with a negative effect on the afterglow brightness.

By following these instructions, the color of the afterglow end product will be a pale yellow- green. A discolored end product indicates processing problems, such as decomposed polymer material as a result of overheating, abrasive wear or dust.

For colored end products, use mixtures of SN pigments with red, blue or yellow dye.

Minimizing Mechanical Stress on Pigments

- Avoid using any device that may cause mechanical damage to the crystal structure of the luminescent pigment. In an extrusion process, it is desirable to add the afterglow pigment at the stage when the polymer has already softened. This way, the mechanical stress on the crystal is effectively minimized.
- During the manufacturing process, carefully observe the extruder for signs of abrasion. If significant abrasion is evident, a more suitable type of steel on the inside walls and the screw should be considered.

In general, for molding or extrusion, Lumilux master batches are the best choice.

NOTE:
Phosphorescent pigments are very hard pigments with sharp edges.

GRADE NAME	MOHS HARDNESS
Green SN grades	Approximately 9 (comparable to alumina)
Blue SN grades	Approximately 6 (comparable to glass)
Green N	Between 4-5

The table above lists the Mohs hardness of the different grades.

Further Recommendations for Incorporating Pigments into Plastic

For optimal results, follow these recommendations:

- Run the virgin resin until it leaves the machine completely clean to ensure that extruders are free of any colorants from previous processes.
- Use a twin-screw extruder with twin hoppers. The first one should feed the resin and additives and the second should feed the Lumilux phosphorescent pigment into the polymer melt. This will minimize the risk of Lumilux pigments abrading the interior surfaces of the extruder.
- Use a small-bored extrusion machine to minimize the retention time in the machine. Complicated screw geometries and large extruder may cause darkening of the end product.
- Use an injection molding machine equipment with small chambers. The resin should not remain in the upheated chamber longer than 30 minutes.
- In advance of manufacturing, pressure and maximum operating temperature should be determined. Keep the actual temperature as low as possible. Carrier resins (waxes) will minimize any darkening effect.
- Keep the blending time of pigment and polymer material as short as possible.

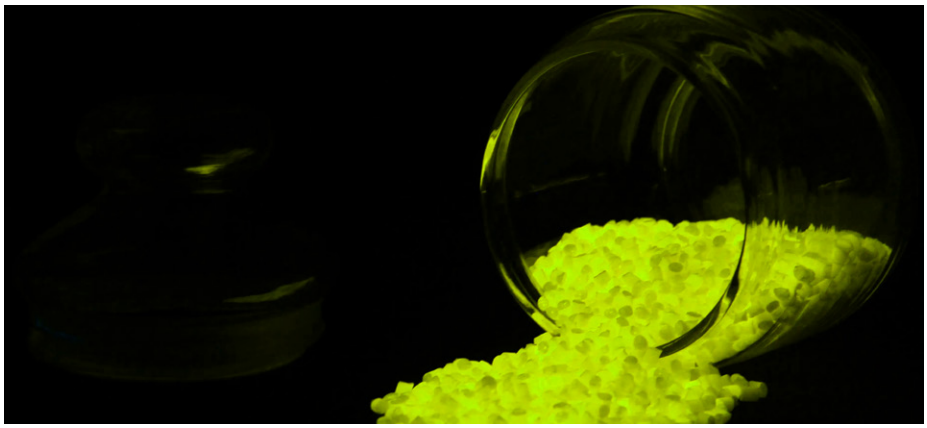
Phosphorescent Waterbased Dispersion Paints

- To formulate an aqueous dispersion paint with a Lumilux Green N pigment, use a commercially available transparent paint. The best effect will be achieved by mixing 120 parts by weight of the aqueous dispersion paint and 300 parts by weight of the Lumilux afterglow pigment.
- To prevent breakdown of the crystal structure in afterglow pigments, the mixing speed should be very slow.
- If the paint is stored without being moved for some time, settling might occur. This is a result of the high density of the afterglow pigments; however, this should not affect the quality of the paint.

Silk Screen Printing Inks, Synthetic Resins and Paints

All Lumilux afterglow pigments are suitable for inks, synthetic resins and paints. Follow these recommendations for optimum results:

- Apply a white substrate to receive higher afterglow brightness. To avoid pigment settling in ink, the viscosity of the ink should be approximately 4000 poise, adjusted for the printing process.
- Coating with UV absorbers is recommended to protect the Lumilux Green N pigments and extend the lifetime of the afterglow luminance. This is not necessary when using SN grades.
- To reach minimum afterglow brightness, 400-500g/m2 of a Lumilux Green N grade or about 30g/m2 of a Lumilux Green SN grade should be used.
- Higher afterglow brightness demands significantly higher pigment loading. Many safety sign manufacturers apply pigment loadings up to 500 g/m2 and achieve extremely long afterglow properties in their end products.



NOTE:
The Lumilux SN pigments may decompose if exposed to water or humidity.

Coating of Textiles

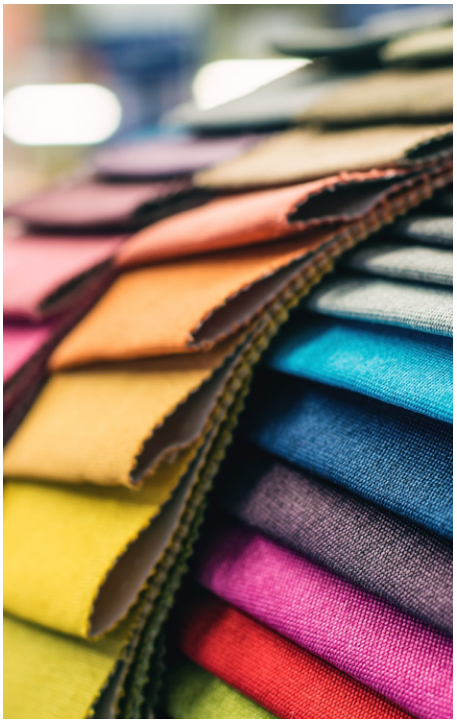
Fabrics such as cotton, polyester and polyamide are suitable for coating with afterglow Lumilux pigments. The coating can be applied by using the usual methods; PVC, PU and PE are proven binders. The typical concentration of Lumilux pigments used for the coating varies between 20% and 24% by weight.

Luminescent Enamels

- Ensure that the frits used during production are free of heavy metal additives such as lead oxide. Grinding of the pigment with the frit may destroy the crystal structure of the pigment and thereby, reduce the afterglow properties of the end product.
- Typically, better brightness can be achieved when the substrate is coated with a white primer to improve reflection of light.
- Low processing temperatures and short processing time is beneficial for the brightness. Therefore, use a frit with a low melting point and the firing time at maximum temperature should not exceed 10 minutes. Processing temperatures up to 800°C do not typically damage Lumilux afterglow pigments if the exposure is short.

Use of ZnS-based Green N Grades

- Avoid the use of additives and stabilizers that contain traces of heavy metals. Heavy metals may react with zinc sulfide- based afterglow pigments and reduce the brightness of the pigment.
- Incorporate UV absorber into polymers and a protective film coating applied on top of films or sheets (e.g., PVC) after the calendering/ casting process.
- This reduces the graying of zinc sulfide pigments.
- Conduct appropriate testing of materials and manufacturing techniques to ensure the quality of the end product.



For more information

https://industrial.honeywell.com/us/en/products/authentication-technologies

Honeywell Advanced Materials
115 Tabor Rd
Morris Plains, NJ 07950
USA
www.honeywell.com

Although Honeywell International Inc. believes that the information contained herein is accurate and reliable, it is presented without guarantee or responsibility of any kind and does not constitute any representation or warranty of Honeywell International Inc., either expressed or implied. A number of factors may affect the performance of any products used in conjunction with user's materials, such as other raw materials, application, formulation, environmental factors and manufacturing conditions among others, all of which must be taken into account by the user in producing or using the products. The user should not assume that all necessary data for the proper evaluation of these products are contained herein. Information provided herein does not relieve the user from the responsibility of carrying out its own tests and experiments, and the user assumes all risks and liabilities (including, but not limited to, risks relating to results, patent infringement, regulatory compliance and health, safety and environment) related to the use of the products and/or information contained herein.

RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

THE FUTURE IS WHAT WE MAKE IT

BRO-23-76-EN | 08/23
© 2023 Honeywell International Inc.

Honeywell