MATERION ADVANCED MATERIALS GROUP

Coating Material News

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Highly Engineered Magnesium Fluorides

Over the past few years, Materion has worked to greatly expand our fluoride portfolio which spans the optics, photovoltaic, phosphor and battery materials industries. Just as with ytterbium fluoride (YbF_3)_a viable alternative to yttrium fluoride (YF_3) and thorium fluoride (ThF_4) for the infrared (IR) market - increasingly customized processes are required to meet different performance challenges. An example of that is magnesium fluoride (MgF_2), which is critical in designs from the deep ultra violet (DUV) to the near infrared (NIR), and for that reason different production techniques have led to different products.

Differentiating MgF_2 Materials

To understand why this is the case, we must look beyond its rather simple chemical reaction and into the raw material itself and the processing steps that follow. Often times these aspects are overlooked, or are buried so deep in the history of a product that they are taken for granted. Such factors are not considered when new products are proposed, or vendors are changed, which can jeopardize both time and development costs. The following will hopefully serve as a common reference point in differentiating MgF_2 materials and explaining how process refinements ultimately determine which product is best for an application.

Thin Films in the Ultraviolet Region

There are very few materials that are transparent in the UV – and even fewer at wavelengths less than 225nm (lower limit of oxides). For MgF_2 to be successful at these wavelengths, absorption from any source must be eliminated. Controlling the lattice energy-reducing impurities drives the purity of the grade upwards of 5N and reduces spit from contaminated lower melting point regions. MgF_2 is produced via aqueous reaction and residual oxygen and moisture must be essentially eliminated or risk spit from degassing, surface oxides or exploding particles.

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Battery Materials: Meeting Today's Challenges

With the rapid emergence of electronic devices being used for communication, transportation, safety, commerce, construction, health care and more, battery performance has become an everyday concern. To keep pace, the battery market must continually seek longer life, faster recharge times, greater reliability, unfailing safety and lowered costs. As the developing power conversion industry faces these challenges, it has brought to the forefront new materials to push the boundaries of the energy storage industry.

There are two separate, yet specific areas of ongoing battery research and development: the commercialization of rechargeable conversion batteries and the use of solid state electrolytes.

Developers of secondary batteries are seeking new cell chemistries to increase the amount of energy that can be stored and extend a device's operational lifetime. One approach being developed utilizes fluoride cathode materials such as Aluminum Fluoride (AlF_3), Bismuth Fluoride (BiF_3), Copper Fluoride (CuF_2), Ferrous Fluorides (FeF_2, FeF_3), and Nickel Fluoride (NiF_2).

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High Performance Fluoride Compounds

Materion Introduces Innovative Fluoride Starter Sources

Building on past success with pre-melted oxides, Materion has developed a novel approach to producing vacuum-cast specialty optics grade fluoride compounds. The new melts are available in a range of compositions including magnesium fluoride (MgF_2) to ytterbium fluoride (YbF_3) and Yttrium fluoride (YF_3) and shapes such as cones and evaporation discs. These Fluoride "starter charges" fit directly into liners or hearths and are currently for visible infrared (VIS/IR) materials although future plans will include DUV.

The use of dense and conformal melts in the production process is particularly suited for long or short runs where stability is key; furthermore, risks such as particle outgassing, operator variance, environmental contaminants or collapsing granule underlayers must be minimized. The homogenous charges can offer advantages over using granulated forms (crystals, pellets) by offering a stable evaporation surface for a more uniform coating, consistent deposition rate, reduced spitting and maintaining a good melt pool over long runs.

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Events

SPIE. PHOTONICS WEST

Feb 16-18, 2016
San Francisco, CA
Booth # 3092

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