



Inorganic Chemicals & Thin Film Coating Materials

Coating Materials for High Reflectors



Considerations Involved in Design and Production

Reflecting coatings that provide near-maximum reflectance are used in all types of optical systems, as well as in solar energy concentrators, general illuminators and instruments

using high-energy lasers. The following discusses applications and coating materials for reflectors used in UV-through IR regions.

High-reflecting mirrors used in the visible range, where the requirements are less demanding, are satisfied by aluminum and silver metals with protective or reflection-enhancing dielectric layers. However, mirrors for long-wave IR wavelengths use coatings of gold. Bare metals provide high reflectance but they are susceptible to chemical attack and abrasive scratching by handling and environmental components. Because of that, they are protected by over-coating with dense (impermeable) hard dielectric layers. Typical protective dielectric materials include aluminum oxide, silicon oxides, and some rare-earth oxides. The choice is dictated by the spectral region of operation.

Metal Reflectors

The optical properties of metals are characterized by their refractive index and extinction coefficient (n & k) values dispersed with wavelength. The k values for metal are high and the n values are low, which makes them good reflectors. These properties are in direct opposition to dielectric materials. The large k/n ratio over large wavelength ranges gives these metals high and somewhat neutral reflection. [Read more about Coating Materials for High Reflectors](#)

In This Issue:

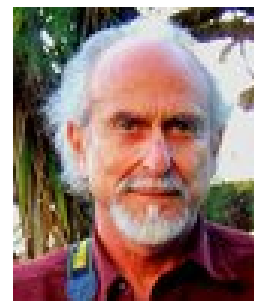
[Nickel Gold & Silver - Critical Materials](#)
[Coating Materials for High Reflectors](#)
[50 Year Anniversary Achievement Awards](#)



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Face to Face Around Materion



Introducing long-term associate **Samuel Pellicori** – the man behind the newsletter. Sam has been the key contributor to Coating Materials News since its inception. As an optical coating

Nickel, Gold and Silver - Critical Materials

Enabling Optics, Semiconductors and Large Area Solutions

There are certain metals that are critical in the production of PVD coatings. As a global supplier of Semiconductor and Specialty Optics PVD materials, Materion

Advanced Materials Group

(AMG) focuses on their use as electrical contacts and their key role as adhesion, barrier and working layers in reflectors for IR laser mirrors, LEDs and Low-e Glass. It is important to review the fundamentals of these metals to illustrate the applications driving their use. Following, we summarize characteristics of nickel (Ni), nickel-chrome (NiCr), nickel-vanadium (NiV), gold (Au), silver (Ag) and silver alloys.



Nickel (Ni)

This metal is generally used as an under layer plating in electrical connector applications for other contact metals such as gold, tin or palladium. It simultaneously acts as a barrier layer to prevent diffusion of the base metal to the surface. In the case of tin-coated contacts, nickel prevents the formation of copper-tin intermetallics while passivating pores and bare edges, thus reducing the potential of pore and creep corrosion.

Gold (Au)

This metal makes a soft, inert, low-friction, high conductivity coating. As an electrical contact, it has exceptional corrosion resistance and excellent reflection into the LWIR. However, gold wears easily, does not solder well, and requires an adhesion promoter and/or barrier layer to properly function. As a contact, it is often used in low current or high reliability applications where it places a heavy emphasis on cooling or multilayer metal adhesion layers. In these cases, especially for solderable contacts or mixed plating/PVD approaches, nickel, titanium and other mixed-use barrier/adhesion stacks are employed.

Silver (Ag)

Silver provides the highest conductivity of any metal. As an electrical contact, pure silver is used in high current applications where minor arcing may occur. While it does not readily oxidize, silver can tarnish easily in the presence of chlorine, sulfur, and acidic environments. Silver composites and silver metal oxides are more resistant to arc erosion than plain silver. Because of that, they are used in higher voltage switches where there is potential for severe damage from arcing. [Read details about each of these critical materials...](#)

specialist with his own consulting business, Sam is an expert in coating materials and their applications for use in UV through IR regions.

Sam's relationship with Materion began in 1984, when the company was still known as CERAC. He published a paper that inspired CERAC founder Dr. Erv Colton with the creation of IRX., a thorium fluoride replacement. As a result of their work, a Patent was awarded to Materion for IRX.

[Read more about Sam's background...](#)

Materion Honors Team Achievements



The 2013 Continuous Improvement Awards: demonstrated a commitment to excellence and a dedicated effort to create value for our customers."

First place: Milwaukee, WI team for their project on Zinc Arsenide Combustible Dust Improvement.

Second Place: Wheatfield, NY team for their work on Alternate Chemistry Shield Kit

Cleaning. **Third Place:** Buffalo, NY team for their Cleanliness Improvements to Evaporation Slugs.

[Read more details on the recipients...](#)

50 Year Milestone Reached

50

Materion Celebrates Anniversary

The advanced chemicals business of Materion's Advanced Material Group celebrates its 50 year anniversary this month. Headquartered in Milwaukee, the business was known as CERAC before it was rebranded along with other businesses into Materion Corporation in 2011. Since 1964, Materion and its CERAC predecessor have been selling unique, difficult-to-make ceramic, metal and composite chemical materials globally. Today, it manufactures more than 2,000 inorganic chemicals and is at the forefront of developing innovative new products ranging from alternative energy chemicals to semiconductor grade evaporants to specialty target compositions.

"As the organization honors this 50th anniversary, we congratulate all those who contributed to its impressive technical history first as CERAC and later as Materion. We look forward to continued success as we grow together," commented E.J. Strother, Vice President, Marketing, Materion Advanced Materials Group. [Read about the celebration...](#)



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Learn more about [Materion coating materials](#) to support glass industry applications.

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