
**February 2013**

## Message from Materion Management

Welcome to our first edition of *Optical Innovations News*, Materion Barr Precision Optics & Thin Film Coatings' quarterly newsletter. Our goal is to provide you a window into our business and share new product developments, technology enhancements, and innovative solutions for your challenges, big and small. Along the way, we'll introduce and share success stories of some of our key technology professionals who are responsible for driving the innovative process at Materion.

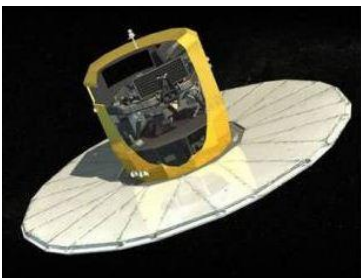


*Robert Naranjo, VP  
SBU Materion Barr  
Precision Optics &  
Thin Film Coatings*

Many of you already know us as one of the world's leading providers of highly complex, precision optical thin film coatings, optical filters and optical sub-assemblies. Our business spans the globe with markets and applications as diverse as terrestrial and space-based astronomy, high-energy lasers, night vision, environmental sensing, blood analysis, DNA sequencing, surveillance, targeting, gas & fire detection, commercial electronics, and many more.

With our broad scope of products and services, we hope to feature newsletter topics that you find engaging and useful for your particular market. If you have any questions or something piques your interest, our global representatives will respond to your request if you [provide contact information](#). We look forward to communicating our message of "innovative solutions" as we strive to become our Customer's First Choice.

## Gaia: A Success Story



*Gaia Payload Module with  
Materion Filters. Photo Credit:  
European Space Agency*

Gaia is a European Space Agency (ESA) "Cornerstone" mission with a value around \$1 billion. Materion Barr Precision Optics & Thin Film Coatings contributed to this major event by providing large, precision filters for two (the Photometer and Radial Velocity Spectrometer - RVS) of the science instruments in the Gaia Payload Module (PLM). Gaia's task over its three year mission will be to perform a "galactic census" which will catalog the precise three dimensional location and other astronomically significant characteristics of about one *billion* stars. This data will be used for a range of scientific endeavors including detailed information regarding exoplanet locations used by ground-based and space-based science teams.

Materion managed both projects and produced the special coatings in our Westford, Massachusetts facility. The RVS filter is a large format (approximately 8.5 x 7 inches) precision optic with very challenging surface figure and spectral requirements. The flatness required is less than 20 nm deviation from a perfect plane, no easy achievement to fabricate or measure. During its development, the Gaia team comprised of Materion and EADS Astrium, the prime

### In This Issue

[Low Defect Wafer Coatings](#)  
[Filter Micro-Assembly](#)  
[Gesture Recognition](#)  
[Wafer Level Packaging](#)  
[NASA Award Nomination](#)



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### IN THE NEWS! Space, Science & Astronomy



*LDCM After  
Environmental  
Testing. Photo  
Credit: Orbital  
Sciences  
Corporation*

### NASA LAUNCHES NEXT GENERATION LANDSAT SPACECRAFT:

Landsat Data Continuity Mission (LDCM) launched on February 11, 2013 from Vandenberg AFB, California. This is the latest mission in the 40 year Landsat program. Upon commissioning, the operation will be turned over

contractor, resolved a number of fabrication and measurement issues that ultimately achieved a filter substrate with superior surface figure. Various subcontractors handled polishing and metrology tasks that also contributed to its success.

[Read more on the Gaia success story...](#)

## Materion Nominated for NASA Group Achievement Award

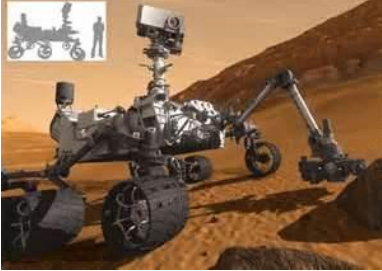


Image Credit: NASA Mars Science Laboratory

The Mars Rover (*Curiosity*) project team at Materion Barr Precision Optics & Thin Film Coatings' Westford, MA facility, has been nominated for the NASA Group Achievement Award. This prestigious NASA honor is awarded to any combination of government and/or non-government individuals for an outstanding group accomplishment that has contributed substantially to NASA's mission.

*Curiosity* is a key part of the Mars Space Lab mission launched in November 2011. Materion's assignment involved building a set of filters for the MASTCAM camera aboard the craft. These are extremely high performing, low

defect state-of-the-art filters used to enhance the camera's imaging capabilities. The camera was produced by Malin Space Science Systems (MSSS) with whom Materion has a long-standing relationship.

The work team, all members of the Space, Science & Astronomy Div. of the Westford Operations Group, was led by Dave Harrison, Program Manager, and consisted of: John Potter, Sr. Design Engineer; Jim Gaillardetz, Sr. Technician; Paul McTeague, Engineering Technician; Kevin Downing, Product Line Manager; David Green, Applications Engineer and Evelyn Stull, Applications Engineering Manager.

[Read more about the NASA award nomination...](#)

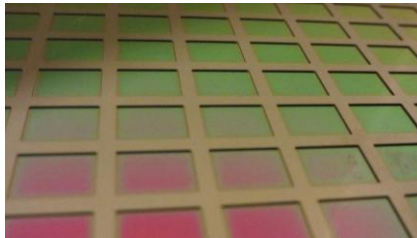
## Pushing the Envelope - Wafer Level Packaging Technology

Materion Barr Precision Optics and Thin Film Coatings has the reputation of pushing the envelope when it comes to new technology and higher quality levels. When the requirements for IR wafer level packaging (WLP) forced all previous practices to change related to coating silicon, we were already one step ahead.

Materion has been developing improved coating capability for the WLP challenge since 2008 and has made significant strides in defect reduction. 80/50 is no longer considered an acceptable scratch dig specification. Companies are now requiring coating defects to be smaller than a third the size of a human hair or 20um. Coatings are also required to withstand temperatures up to 400 degrees Celsius. The new IR coatings at Materion achieve both objectives.

Materion did not stop there. Each package cavity requires close inspection for defects that cannot be seen by the human eye. To address this issue, Materion purchased an automated inspection tool and developed unique software that allowed mapping out of each cavity to determine if it would be acceptable for the end use. This allowed for the production of the highest quality product.

[Read more about wafer level packaging technology...](#)



to the US Geological Service which distributes Landsat data gathered by the satellite. Materion Barr Precision Optics & Thin Film Coatings provided filters for the ETM+ sensors in both the Landsat 6, which was lost in a launch failure, and for Landsat 7. An LDCM precursor instrument (Advanced Land Imager) equipped with Materion array filters was flown on the EO-1 satellite in November 2000. For the upcoming LDCM, Materion provided twenty sets of 9-band filter arrays each for an Engineering Model, Flight Model and Flight Spare.  
[Read more on NASA Landsat...](#)



**Astrium's NAOMI camera fitted with Materion multispectral arrays. Photo Credit: EADS Astrium, France**

## VIETNAM LAUNCHES 1ST EARTH OBSERVATION SATELLITE:

Vietnam will launch its Earth Observation satellite, VNRED Sat-1A, in April on a VEGA vehicle from Arianespace's French Guiana launch complex. Aboard the vehicle will also be ESA's PROBA-V environmental payload. Materion Barr Precision Optics & Thin Film Coatings provided the multispectral filter arrays for both missions. Materion's customer for the VNRED filters was EADS Astrium Space (Toulouse). Over the last decade, they have also used Materion filters in a number of their NAOMI Earth Imaging instruments.

PROBA-V is an ESA-supported, Belgium national environmental mission. Its instrument has three identical cameras to provide an exceptionally wide field of view with each camera fitted with a Materion multiband filter array

## Gesture Recognition Technology & Precision Optical Filters



Gesture Recognition, sometimes referred to as Gesture Control, is an exciting new technology that enables human gestures to be interpreted by machines through the use of mathematical algorithms. This technology was popularized by the *Kinect* sensor device launched in November 2010 as an accessory to the *Xbox 360* Gaming system. It enabled the user to interact with the gaming system without the need for a mechanical controller. This device was extraordinarily popular, and sold eight million units within the first 60 days of its launching, making it the fastest selling consumer electronics device in history.(1)

While gesture recognition technology is primarily used today for the conversion of human gestures to electronic commands for gaming, there is a multitude of challenging applications under development that will change how we interact with everyday products. This technology is rapidly expanding and is expected to proliferate in industries with broad consumer impact, including health/lifestyle, television, computer interfaces, advertising, display systems, security and even automobile cabin controls.

[Read more about gesture sensing technology...](#)

## Filter Micro-Assembly Taken to a New Level

With the successful design and construction of a 137-element multi-spectral filter micro-array, Materion Barr Precision Optics & Thin Film Coatings continues to push its innovative capabilities in the micro-assembly of discrete filters. Each element of the 137-element array is a high precision thin film filter that is only 0.072 millimeters wide and approximately 200 microns thick.

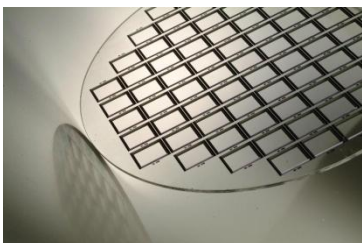


In addition, Materion, a developer and manufacturer of filter arrays for over 25 years, is designing a new Enhanced Multispectral Filter Array. This unique array will be composed of individual elements precision-diced, assembled and designed to match the light angle of incidence of the optical system, thus reducing/eliminating stray light. The individual filter elements can be as narrow as 0.020mm.

A key driver behind Materion's development of filter arrays is the desire to reduce mass, power and volume in multi-spectral sensors. This was achieved by eliminating the filter wheel or many discrete filters. The main advantage of the new micro-array technology is the increased number of spectral bands. This allows for accommodation in a smaller volume and compatibility with higher resolution (smaller pixels) detector arrays.

[Read more about multi-spectral filter micro-arrays...](#)

## Shanghai Facility Excels with Low Defect Wafer Coatings



High volume, advanced wafer level optical packaging technology relies heavily on the quality of low defect wafer level optical coatings. This type of packaging is used in many high volume applications that include micro-mirror arrays, optical MEMS & LCoS micro-displays, ambient light sensing, and imaging sensors.

Materion Barr Precision Optics & Thin Film Coatings understands the need for state-of-the-art quality and has

For SS&A and Materion products and services, contact Tom Mooney, Product Engineering Manager at: [Thomas.Mooney@Materion.com](mailto:Thomas.Mooney@Materion.com)

## Meet Materion: Bob Sprague



Materion's Director of Technology, Robert Sprague, has been with the company for over 15 years, back to when it was still the former Barr Associates. He is responsible for the Rapid Development Center and reports to Ian Tribick, VP/CTO/COO. Bob was educated at the University of Arizona, and holds PhD and Masters degrees in Optical Science, as well as a BS in Physics.

Before coming to Materion, Bob worked in a range of interesting technical positions in widespread locations. He worked in the Mining field as an analytical chemist, in optical research at the Naval Research Laboratory (NRL) in Washington, DC, as a thin film researcher at the Ecole Nationale Supérieure de Physique de Marseille, France and at the University of Otago in Dunedin, New Zealand.

[Read more about Bob Sprague...](#)

established extraordinary defect control in our facility located in Shanghai, China. We produce high reliability glass wafers with low defect optical coatings for optimal performance. Materion provides antireflective, IR-cut, opaque chrome or IMITO as low defect coatings on wafers that meet tight restrictions for defects in size and density. We know this is critical in devices where cover glass is located very close to the focal plane. We are able to achieve these stringent specifications through dedicated equipment in our clean room environment and our extensive thin film coating capabilities.

[Read more about Low Defect Wafer Coatings...](#)

*Coming in April...*

[SPIE - Defense,  
Science & Security  
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Baltimore, Maryland

**Visit Materion at  
Booth 1825.**

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