

# EUV-XUV Astronomy

Precision Large Scale Coatings for  
Custom Multilayer Optics and Applications



## Diffractive Optics for Specific Energies:

X-ray Astronomy is one of the most important fields of study for understanding our universe. As the application of X-ray Analytical tools and techniques continues to expand, Cosmologists, Astronomers and Astrophysicists require evermore complex diffractive optics to reveal the secrets of the universe.

Precision large scale multilayer coatings for EUV-XUV optics are customarily used to collect, consolidate and analyze data at specific wavelengths of light. EUV-XUV Multilayer optic technology has advanced to become an important technique for producing precise diffractive optics for multidisciplinary studies and astronomical research activities in Government and Private Research Institutes.

Continual research and development in various engineering and manufacturing techniques have afforded Rigaku Innovative Technologies, (RIT) the unique ability to produce multilayer coatings in a wide variety of period, structures and geometries to optically discriminate specific wavelengths from hard x-rays (<0.1nm) to the EUV-XUV band (10-100nm).

Over a quarter of a century of applied and experimental techniques has provided RIT with extensive knowledge in substrate diffraction gratings; conformally coating the surface to enhance their performance.



Rigaku Innovative Technologies' new large format in-line coating system. Developed specifically for EUV optics.



Rigaku Innovative Technologies' laboratory sized experimental multilayer optics are available for quick delivery.

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## Protective Coating Top Layers

RIT understands that many multilayer optics endure harsh conditions, such as high X-ray flux in the presence of oxidizing or reducing atmospheres. To this end, an array of thin-film protective capping layers are available, such as SiC or other various oxides.

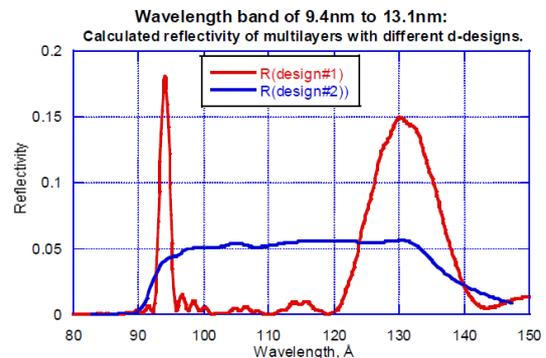
## Clean Room Facilities

RIT has implemented and strictly adheres to stringent cleanliness and contamination control procedures for all precision optics produced at any of our 3 class 100 clean room facilities. All multilayer handling and deposition are done in clean room environments, equipped with mini-environment chambers available for the most critical coating operations.

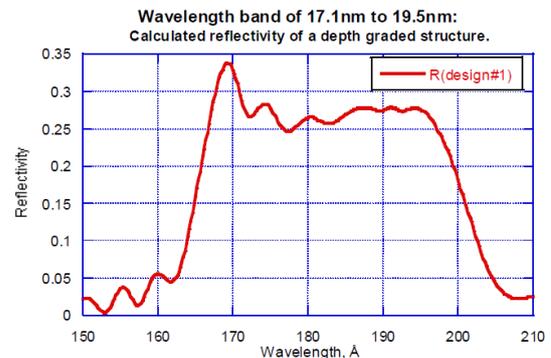
## Professional Engineering Services

RIT is staffed with some of the foremost experts in multilayer coatings and instruments. Additionally we have cultivated strategic substrate partnerships to provide our clients with the products and reliability they have come to expect and demand.

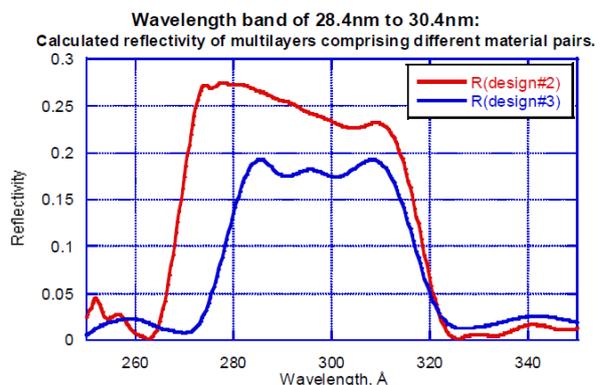
Our team of renown scientists are available to discuss your specific applications and unique challenges. Whether you are working on a long or short term project, or simply designing a proof-of-principle experiment, RIT can provide you with the most current experimental and theoretical estimates of multilayer performance at specific X-ray energies. RIT is the premiere turnkey solution provider for X-ray Astronomy Optic applications.



Calculated reflectivity spectra for a pair of multilayer designs focused on a 9.4 nm (131.9 eV) and 13.1 nm (94.6 eV). The two designs demonstrate the flexibility of the spectral response to the experimental needs.  
\*\*Each design is based on practical experience for the layer and interface quality\*\*



Calculated reflectivity spectrum for a depth-graded multilayer structure designed to allow broadband performance in the 17.1 - 19.5 nm range (63.5 - 72.5 eV). Depending on specific requirements, further optimization or tuning of this design is possible.  
\*\*The design is based on practical experience for the layer and interface quality\*\*



Calculated reflectivity spectrum for a pair of multilayer structure designs to allow broadband performance in the 28.4 - 30.4 nm range (40.7 - 43.7 eV). The design has lower reflectivity but is more uniform within band; further optimization or tuning of these designs are possible.  
\*\*Each design is based on practical experience for the layer and interface quality\*\*



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