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UV-coated optical filters for space based optical systems to study space-based processes **FREE**

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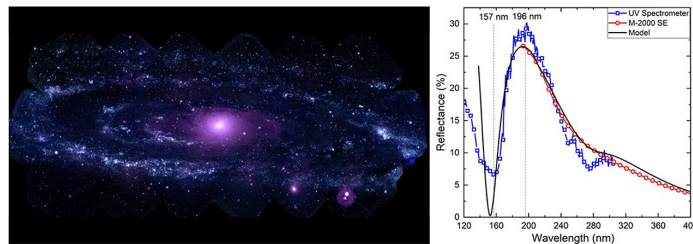


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Using atomic layer deposition to create high-precision, multilayer, UV-based optical systems to study star formation in galaxies



Since optical observations of some galaxies have showed enhanced ultraviolet emission from star forming regions, researchers are focusing on developing better UV optics to study star formation in galaxies. Huang et al. illustrate methods to fabricate multilayer interference optical filters for space-based optical systems that could help understand galactic processes.

The researchers focused on depositing fluoride materials one atomic layer at a time to achieve high purity layers with precise thickness control and high uniformity. Ultimately, they demonstrated an optical filter meeting design specifications for ultraviolet wavelength measurements.

“We proposed to NASA using atomic layer deposition to provide a route for fabrication of high precision multilayer structures based on UV materials,” said author Robert Nemanich. The new UV materials included fluorides, such as aluminum fluoride or magnesium fluoride, which have inherently large optical gaps.

When an optical layer is exposed to air, its properties change significantly. Consequently, the researchers combined a UV spectroscopy system and thin film growth system, where the grown layers could be measured and successively applied without exposure to the atmosphere.

Future work will study new combinations of fluoride and other materials to extend the optical wavelength range to less than 100 nanometers.

“We would anticipate new multilayer materials will be studied to achieve UV optical systems for applications from space-based spectroscopy to optical communications to provide a working solution for narrowband filter in the UV, something that has been heretofore unavailable,” said Nemanich.

Source: “Multilayer ultraviolet reflective coating based on atomic layer deposited aluminum oxide and fluoride,” by Zhiyu Huang, Daniel C. Messina, Brianna S. Eller, Franz A. Koeck, Paul A. Scowen, and Robert J. Nemanich, *JVST A* (2021). The article can be accessed at <https://doi.org/10.1116/6.0001010>.

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