Building a Better ALD - use of Plasma Enhanced ALD to Construct Efficient Interference Filters for the FUV

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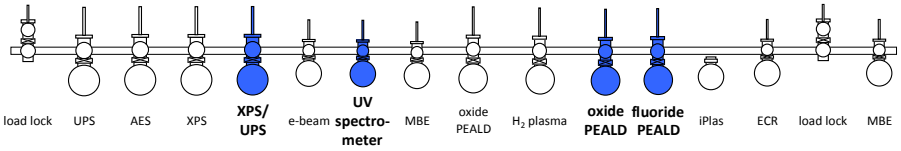
Objectives and Key Challenges:

- Use a range of oxide and fluoride materials to build stable optical layers using PEALD to reduce adsorption, scattering and impurities
- Layers will be suitable for protective overcoats with high UV reflectivity and unprecedented uniformity (compared to thermal ALD)
- Development of single-chamber system to deposit metal oxide and dielectric layers without breaking vacuum

Significance of Work:

- To use the improved ALD capability to leverage innovative ultraviolet/optical filter construction

Integrated processing and characterization UHV chambers:



Approach:

- Development of existing PEALD system to a single-chamber model
- Demonstration of Al film deposition
- Demonstration of Fluoride deposition on top of Al films
- Demonstration of VUV reflectivity, uniformity and stability

Key Collaborators:

- Paul Scowen, Robert Nemanich, Brianna Eller, Franz Koeck, Hongbin Yu (ASU)
- Tom Mooney (Materion)
- Matt Beasley (Planetary Resources Inc.)

Current Funded Period of Performance:

- Dec 2015 through Nov 2018

Recent Accomplishments:

✓ Program just getting started, but designs for chambers and milestones and metrics have been defined

Next Milestones:

- Design and install in-situ VUV spectrometer to measure performance down to 120nm – calibrate performance using NIST-calibrated UV detector – June 2016
- Demonstrate deposition of Al films using PEALD and measure UV reflectivity – measure to accuracy better than 3% - December 2016
- Demonstration of the deposition of low-loss oxides on evaporated Al surfaces – provide usable surface for reflection below 190nm – September 2016

Application:

- LUVOIR / HDST / ATLAST

$TRL_{In} = 4$ $TRL_{PI\text{-}Asserted} = 4$ $TRL_{Target} = 5$