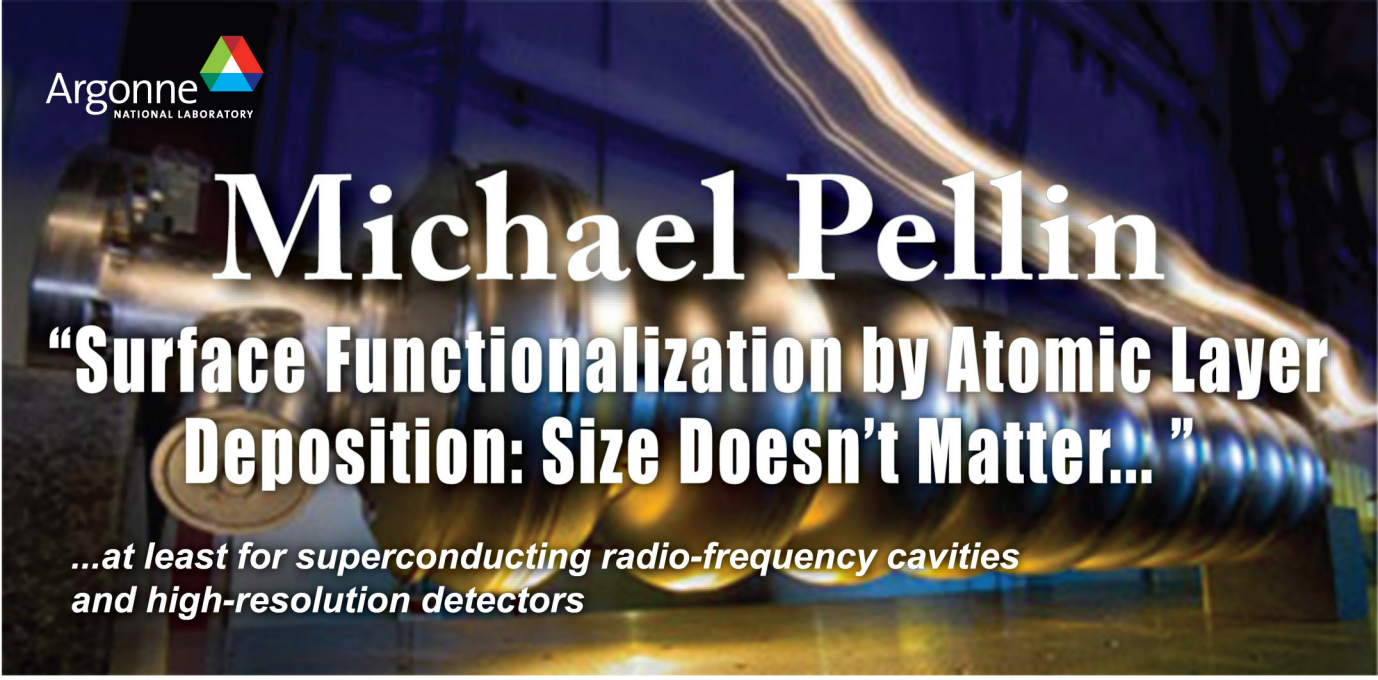

Michael Pellin

"Surface Functionalization by Atomic Layer Deposition: Size Doesn't Matter... "

...at least for superconducting radio-frequency cavities and high-resolution detectors

Atomic layer deposition (ALD) is a surface synthesis technique that relies on (at least) a pair of self-limiting surface reactions separated in time to produce the desired material growth, and which, upon completion of both reactions, reproduce the original reaction surface.

This simple statement belies a significantly different method for producing surface films. Self-limiting means that as opposed to most surface growth schemes, these reactions have a hard stop; i.e., exposure beyond saturation will not induce further growth. Reproduction of surface functionality following the second self-limiting reaction implies that this pair of reactions can be repeated as many times as necessary. In combination this means that without regard to shape, size, or aspect ratio surfaces can be functionalized with layer by layer precision.

We have been using this unique capability for a wide variety of energy relevant materials including dye-sensitized solar cells, subnanometer catalysts, superconducting radio-frequency cavities, and new structures for time- and spatially-resolved detectors. The talk will detail progress in the latter two areas.

Michael J. Pellin received his doctorate in physical chemistry from the University of Illinois at Urbana-Champaign in 1978 and came to Argonne as an Assistant Chemist that year. He is Director of the Materials Science Division, Deputy Director of the Argonne Northwestern Solar Energy Research (ANSER) Center, and an Argonne Distinguished Fellow. He leads a world-class research effort in understanding the surface chemistry of materials. His studies include basic research into the mechanisms of directed energy interactions with surfaces such as sputtering and laser desorption. His trace analysis instruments are used in the analysis of presolar grains providing insights into stellar nucleosynthesis and in the study of Genesis flight coupons allowing the most accurate determinations to date of the abundance of the elements in the solar system. He also leads a world-class effort in materials synthesis using atomic layer deposition for functionalizing nanoporous and nanostructured materials. He is author or co-author of more than 200 peer-reviewed publications, serves on the Chicago Center for Cosmochemistry Advisory Board, is a Professor in the Northwestern University Chemistry Department, and a part-time professor in the Department of Geophysical Sciences at The University of Chicago.

Wednesday, October 7, 2009

3:00 p.m.

Bldg. 402 • APS Auditorium
Argonne National Laboratory

APS Colloquium