

DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE
SEMINAR SERIES
FALL 2021

DATE: WEDNESDAY, NOVEMBER 3, 2021

LOCATION: Kupfrian Hall - 117

TIME: 1:00-2:20PM

GUEST SPEAKER

Andrew Teplyakov
Professor
Department of Chemistry and Biochemistry
University of Delaware
Newark, DE

TOPIC

Selectivity in Molecularly Precise Deposition and Etching Processes

ABSTRACT

Atomically precise manufacturing is quickly becoming a reality. With a number of recent technological breakthroughs, atomically-precise devices clearly make it into the realm of accessible products. Thus, the device features and the overall properties of the corresponding multilayer constructs have to be manipulated at the scale where chemical transformations and surface processes have to be understood at the highest possible levels of precision.

This presentation will cover recent insights into the mechanistic origins of selectivity in atomically precise processes demonstrated by Teplyakov group. It will combine the two main research projects: One focused on the initial stages of atomic layer deposition (ALD) on functionalized silicon surfaces, where a monolayer functionality can be used as a resist or a promoter of deposition; and the other dedicated to combining the knowledge of atomic layer etching (ALE) mechanisms for different metals to design the etching processing involving tertiary alloys of these metals with light elements, such as boron. A combination of analytical spectroscopic and microscopic techniques with DFT modeling will be used to answer the key questions, and prototypical device features on patterned substrate will be used to demonstrate the selectivity in selected cases.

BIO

ANDREW V. TEPLYAKOV is a Professor of Chemistry and Biochemistry at the University of Delaware. He has completed his undergraduate degree at Moscow State University, Moscow, Russia, in 1992. He received his PhD from Columbia University, New York, NY, in 1997 under the guidance of the late Professor Brian Bent, where he also worked with Professor George Flynn. After receiving his PhD, Andrew held a postdoctoral position in the group of Professor Stacey Bent (currently at Stanford University, Department of Chemical Engineering). Andrew joined the faculty at the Department of Chemistry and Biochemistry at the University of Delaware in 1998. His research is focused on an interdisciplinary area of surface, interface, and thin film science. His group has developed several novel approaches to understanding chemical binding on surfaces of amorphous diffusion barrier films, surface chemistry of multifunctional

molecules, surface modification of semiconductor materials in ambient, electron transfer and molecular junctions, specifically electronic properties controlled by surface preparation and modification, and more recently, multicomponent heterogeneous catalyst design and atomic layer etching. This research has resulted in over 140 publications and over 115 invited presentations. Andrew is a fellow of AVS, a member of the Eastern Analytical Symposium Governing Board and a member of *Surface Science* and *Langmuir* Editorial Advisory Boards. He is Associate Editor of *Applied Surface Science*.

Committee members:

Dr. Michael Eberhart – me36@njit.edu
Dr. Amir Varkouhi - amir.k.varkouhi@njit.edu