DEPARTMENT OF CHEMISTRY AND ENVIRONMENTAL SCIENCE
VIRTUAL SEMINAR SERIES
FALL 2020

DATE: WEDNESDAY, NOVEMBER 4

TIME: 1:00-2:20pm

LOCATION: Meeting number: 120 119 5689
Password: EuWfUyEJr0YsiA
https://njit.webex.com/njit/j.php?MTID=me5749cc7a258e4d25900ac3478371cb7
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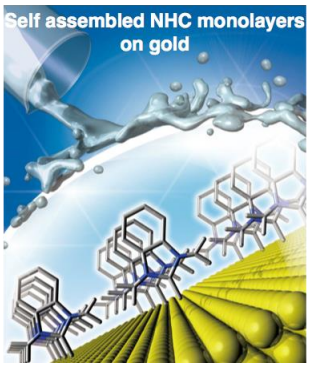
GUEST SPEAKER

Cathleen Crudden
Queen's University, Kingston,
Ontario Canada
The Institute of Transformative Bio-Molecules, Nagoya, Japan

TOPIC

Clusters and surfaces:
The chemistry of carbon-based monolayers.

ABSTRACT



The functionalization of metal surfaces with organic ligands is essential to stabilize metal nanoparticles, to prepare functional biosensors, and in targeted chemotherapy approaches. Although this area has been dominated by sulfur-based ligands, our group and others have demonstrated that N-heterocyclic carbenes (NHCs) may prove advantageous vs. thiols in many applications.

The chemistry of NHCs has been dominated by their use as ligands in molecular organometallics, with their use in materials chemistry only developing recently. Our group has demonstrated that like in organometallic species, NHCs form thermally, oxidatively and chemically robust organic-to-metal bonds that have advantages for the applications of the resulting composite materials.

In addition to the classic use of gold as a substrate, our group has shown that copper, platinum, silver and magnesium are valuable substrates for the formation of NHC-based films, with exciting new results to be presented from the reaction of NHCs with metal oxide surfaces.
Recently, NHCs have been employed outside the realm of planar surfaces, to protect and activate nanoparticles and nanoclusters comprised of as few as 11 gold atoms. New work elucidating the impact of NHC structure on stability and bonding on planar and nanocluster surfaces will be described, as will applications of these unique nanomaterials.

BIO

Cathleen Crudden was born in Belfast, N. Ireland, and raised in Toronto, Canada. She obtained B.Sc. and M.Sc. degrees at the University of Toronto under Professor Mark Lautens. Her Ph.D. was carried out with Professor Howard Alper, followed by an NSERC postdoctoral fellowship with Professor Scott Denmark at the University of Illinois Urbana Champaign. During her Ph.D., she also worked in the labs of Shinji Murai at Osaka University.

Cathleen is currently A.V. Douglas Distinguished Professor of Chemistry and Canada Research Chair (Tier 1) at Queen's University in Kingston, Ontario. She also holds a Research Professorship and runs a satellite lab at the Institute of Transformative Bio-Molecules (ITbM) in Nagoya, Japan. Cathleen has won numerous research awards including the 2019 Cope Scholar award of the American Chemical Society, 2018 Canadian Catalysis Society Award, the 2018 Carol Taylor award from the International Precious Metals Institute, the 2017 R. U. Lemieux award and the 2011 Clara Benson award, both of the Canadian Chemical Society.

Since her time as a student, Cathleen has maintained close ties to Japan, having been a visiting professor in the labs of Professor Ryoji Noyori (Nobel Prize 2001) and a Global Center of Excellence Professor at Kyoto University. She has held visiting Professorships in Spain and France. She is Associate Editor for ACS Catalysis and is a member of the Board of Editors for Organic Syntheses. She sits on the editorial advisory boards of several American, German and Japanese journals. She served as President of the Canadian Society for Chemistry in 2012/2013 and on the Board of Directors for two terms representing the Catalysis Division. She is currently chair of the NSERC–Chemistry Liaison Panel.

Trained as an organometallic/catalysis chemist, Cathleen has recently established herself in materials chemistry. Her recent work identifying a new class of carbon-based SAMs has been called "game changing" and "the new

gold standard" by international experts. She and her group have demonstrated that N-heterocyclic carbenes are a viable alternative to thiols, providing a novel method for the modification of metal surfaces with organic ligands, an approach that works with a variety of metals on planar and curved surfaces. In addition, she has made seminal impacts on the generation of chiral compounds using cross-coupling approaches, and is continuing to push boundaries in the development of novel electrophiles for cross-coupling chemistry.

Committee members:
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