CHEMISTRY SEMINAR

"Bioorthogonal catalysis with gold nanomaterials"

William Ndugire, Ph.D

UNIVERSITY OF MASSACHUSETTS

AMHERST

TUESDAY

OCTOBER 29, 2024 @10:00am

219 BRL

Bioorthogonal chemistry describes the use of synthetic chemical reactions that do not interfere with native processes in the biological environment. Transition metal catalysts (TMC) significantly enhance the kinetics of these reactions. However, TMCs are typically insoluble, cytotoxic, and can be easily deactivated by exposure to the biological milieu. We demonstrate that encapsulation of TMCs on gold nanoparticles (AuNPs) and gold nanoclusters (AuNCs) can overcome these issues and provide efficient nanocatalysts for bioorthogonal reactions. These nano-formulations called 'nanozymes' are successful local activation sites for generating imaging, antimicrobial, and anti-cancer agents from bio-orthogonally inactivated precursors. In addition, we also take advantage of the versatile ligand chemistry on AuNPs/AuNCs to achieve spatiotemporal activation of agents. Crucially, this strategy enhances the efficacy and minimizes off-target effects of drugs; a particularly complex hurdle in anticancer chemotherapy.

William Ndugire received his B.A. in Chemistry from Wesleyan University (Middletown, CT) where he researched microwave spectroscopy under Stewart Novick and Wallace Pringle. He completed his PhD in Chemistry with Mingdi Yan at University of Massachusetts Lowell (Lowell, MA) where he worked on carbohydrate-functionalized gold nanoclusters and polymeric nanomaterials, and their antimicrobial properties. He is currently a post−doctoral research associate in Vince Rotello's lab at University of Massachusetts Amherst (Amherst, MA) focusing on nanomaterial−supported bioorthogonal catalysts for antimicrobial and antitumor therapies. He is the recipient of a NIH/NIBIB diversity supplement, is a Research Corporation of America Fellow and 2024 St. Elmo Brady Postdoctoral Inclusive Excellence Symposium Fellow.

UNIVERSITY OF DELAWARE
ARTS & SCIENCES