Georgia Tech Institute for Electronics and Nanotechnology

Nano@Tech

Tuesday October 10, 2017 12:00pm—1:00pm

Using Microcalorimetry and Reactions Energetics to Probe the Surface of Metal Oxides Nanomaterials

Marcus Nanotechnology Building 1117-1118

Assistant Professor Nadine Kabengi

Dept. of Geosciences and Dept. of Chemistry, Georgia State University

Abstract: Great emphasis has been focused on understanding reactions at nanomaterials surfaces and interfaces, above all metal oxides nanomaterials (MON)/solutions systems. In Earth-surface environment, MON are ubiquitous in nature, existing as relatively pure minerals such as gibbsite and goethite, and as poorly crystalized hydrous oxyhydroxide phases, such as ferrihydrite, that bind and coat other soil components. In technological settings, MON such as rutile and quartz are critical for our energy future as catalysts for the synthesis of chemicals, and for the production of fuel cells, solar fuel photocatalysts, and solid reactants. Our ability to harness MON potential in technological and environmental applications hinges on our ability to adequately model interfacial chemical reactions – protonation, exchange, adsorption, desorption, precipitation, redox, etc. in situ and under realistic operating conditions. A host of experimental and computational techniques have been applied to this task over the last 20 years. Yet among the hundreds of studies published in relation to MON/solution interfaces, very few deal with the thermodynamics of interfacial reactions and even fewer have been directly supported by experimental data. The purpose of this presentation is to introduce a way to change this paradigm through the construction and applications of innovative flow microcalorimetry instrumentations and techniques developed in my laboratory to directly probe interfacial reactions on several metal oxides surface. Illustrative examples will be provided to showcase the usefulness of calorimetrically collected data in general sorption studies as well as in theoretical modeling frameworks correlating MON structure, charge distribution and reactivity. Integrating key thermodynamic data with the advances and sophistication other theoretical, experimental and computational methods have achieved maps out the blueprints of the next-generation of surface reactivity research.

Bio: Dr. Kabengi is an assistant professor in the Department of Geosciences at Georgia State University, where she has been since 2012. She also holds a joint appointment with the Chemistry Department. She received her B.S. and M.S in Agricultural Engineering and Soil Science from the American University of Beirut in Lebanon. She earned a Ph.D. in Soil Physical Chemistry from the University of Florida. Dr. Kabengi's research explores fundamental surface chemical reactions occurring at interfaces between mineral surfaces and aqueous solutions and the role – both basic and applied – these interfacial reactions play in geochemical and environmental contexts, especially as related to the fate and transport of natural and anthropogenic contaminants in earth ecosystems. Dr. Kabengi's expertise lies in the application and construction of flow adsorption microcalorimeters techniques and instrumentations for measuring the energetics and thermodynamic properties of various chemical surface reactions. Other work in Dr. Kabengi's lab explores the availability and mobility of contaminants, colloids and manufactured nanoparticles. Her research methods incorporate laboratory/experimental studies and field work using a wide suite of analytical techniques.

Seminar meetings are held on the second and fourth Tuesday of each month during the academic year at noon in the Marcus Nanotechnology Building conference rooms (rooms 1116-1118).

Pizza lunch will be provided, however we ask that you limit yourself to two slices so that all attendees are accommodated.

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