Quaternary Diamond-Like Semiconductor Chalcogenides for Next Generation Infrared Non-linear Optical Devices.

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Chemistry Seminar on Non-linear Optical (NLO) materials

4:00 p.m.
Monday
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***Via* Zoom**

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Abstract: Currently the only way to access the mid-IR spectral region using all solid-state laser (SSL) technology is with the use of down-conversion processes, such as second harmonic generation (SHG), implementing nonlinear optical (NLO) crystals. Yet, the current commercially-available IR NLO crystals have several shortcomings, including multiphoton absorption effects and low laser-induced damage thresholds (LIDTs) that limit the wavelength range and power output of the devices. Several groups are searching for new IR NLO materials implementing different strategies with hopes to access noncentrosymmetric (NCS) materials, because the lack of an inversion center is the first criterion for an SHG crystal. Our group has chosen to pursue the family of quaternary diamond-like semiconductors because their compositions are predictable based on valence electron rules and their structures are inherently noncentrosymmetric. Recently, we have identified several outstanding quaternary diamond-like semiconductor chalcogenides with strong SHG, impressive LIDTs and phase-matchability over a wide region. This seminar will discuss those results and outline future steps to elevate these materials to next-generation candidacy.

About the speaker: Jennifer A. Aitken received a B.S. in chemistry in 1996 from Rider University in New Jersey, where she conducted research on the preparation of oxynitrides via ammonolysis. In 2001, she obtained a Ph.D. in inorganic chemistry from Michigan State University. Her Ph.D. work focused on the use of polychalcophosphate and polychalcogenide fluxes as tools for the synthesis of new metal thio- and selenophosphates and lithium chalcogenides at intermediate temperatures. She held a postdoctoral research associate position at Wayne State University from 2001-2003. While there, she focused her research efforts on dilute magnetic, semiconducting phosphide materials. Aitken started the position of Assistant Professor in the Department of Chemistry and Biochemistry at Duquesne University in Pittsburgh, PA in 2003. She received an NSF CAREER Award in 2006, and was promoted to Associate Professor with tenure in 2009 and full professor in 2016. Aitken is currently serving as an editor for the Journal of Alloys and Compounds, the chair of the Women in STEM leadership team at Duquesne University and the chair of the American Crystallographic Association Diversity Task Force. Her current research focuses on the synthesis and study of multi-cation, diamond-like semiconductors with applications in nonlinear optics and thermoelectrics. A central theme of the work is the elucidation of structure-property and composition-property correlations in the diamond-like materials for the purpose of controlled physical property tuning.