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Dr. Paige Hall
Assistant Professor
University of Portland

Nanoparticle Design Rules for Colorimetric Plasmonic Sensors

Abstract: Point-of-care devices require technology that is low-cost and easy to use. For example, many at-home diagnostics utilize a color change in a molecular absorber because it can be easily read by eye. Like their traditional molecular counterparts, plasmonic (e.g., gold or silver) nanoparticles exhibit brilliant colors and can change color in response to an analyte. Sensors based on plasmonic nanoparticles are also robust, low-cost, and can be applied to almost any biomarker of interest, giving them enormous potential for use in point-of-care technologies. However, these sensors traditionally employ spectroscopic readout that requires expensive scientific instrumentation, limiting their use to laboratory settings. Our research group has shown that we can move plasmonic sensors out of the laboratory and achieve quantitative colorimetric detection using the camera feature of a smartphone. In doing so, we discovered that a unique set of design rules governs the colorimetric performance of plasmonic nanoparticles and have described a path toward the implementation of low-cost, highly accessible plasmonic tools.

Bio: Dr. Paige Hall received her Ph.D. in physical chemistry from Northwestern University and her undergraduate degree in biochemistry from the University of Notre Dame. She worked briefly in the analytical sensors group at GE Global Research before returning to academia with the goal of teaching at a PUI. She began her first faculty position at Pacific University in Forest Grove in 2014, then joined the faculty at the University of Portland in 2018, where she teaches courses in physical and analytical chemistry. As a chemist trained in the field of nanoscience, her research is highly interdisciplinary and includes aspects of physical chemistry, materials science, analytical chemistry, and environmental science. With a research team made up entirely of undergraduates, she strives to give her students opportunities to work on both big tools, such as electron microscopes, and big problems, such as climate change.