**Paper-Based Sensors for Clinical and Environmental Diagnostics**

Charles Henry
Departments of Chemistry and Chemical & Biological Engineering
Colorado State University

One major push in the field of sensor development is production of cheap and easy-to-use sensors that require minimal external equipment. Microfluidic Paper-based Analytical Devices (mPADs) have received significant attention in this field because they are cheap (costing pennies per device), easy to use, and can carry out a wide range of chemical assays. This talk will focus on recent developments from the Henry laboratory using colorimetric (mPADs) and electrochemical paper-based analytical devices (ePADs) with applications in both environmental and clinical diagnostics. Colorimetric mPADs offer a simple, visual indication of analyte presence and concentration. For screening applications where cost and speed are critical, this format is very attractive. Recent developments in the use of mPADs for detecting pathogenic bacteria and antimicrobial resistance will be shown. While mPADs are attractive for screening applications, they can be limited by their sensitivity and selectivity. ePADs are attractive for these applications because they can be made selective through control of potential, variations in electrode material, and/or chemical modification of the electrode surfaces. Key issues of electrode fabrication and characterization as well as field-based applications have been limited. Here, analysis of metals in aerosolized particulate matter to assess environmental and occupational exposure will be discussed. Use of the systems to measure metal exposure based on wearable aerosol samplers will be presented. Finally, new paper system that supports very high flow rates will be presented. The system supports flow rates of > 1 cm/s, more than 100-fold faster than traditional devices. Both fundamental aspects dictating flow and application of the system will be shown.