How Small Can We Go: Exploring the Limitations and Scaling laws of Air-Microfluidic Particulate Matter Sensors

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Air-microfluidics is a field that has the potential to dramatically reduce the size, cost, and power requirements of future air quality sensors. Microfabrication provides a suite of relatively new tools for the development of micro electro mechanical systems (MEMS) that can be applied to create sophisticated air-based lab-on-a-chip type applications. Such devices have the potential to revolutionize the way we monitor air quality in a similar way as liquid lab-on-a-chip instruments revolutionized medical sciences. This presentation will provide a comprehensive overview of this technology, focusing on air-microfluidic particulate matter sensors. It will describe some of the potential benefits, challenges, and limitations related to designing, building, and validating air-microfluidic circuits with particle-laden air as the working fluid. These presented results build on the continuing research of the Air-Microfluidic Group, a research consortium between University of Illinois at Chicago, Lawrence Berkeley National Laboratory, University of California Berkeley, and the U.S. Environmental Protection Agency. Challenges such as data validity and scalability will be addressed in the context of emerging citizen science initiatives.