Micro-thermofluidic Sensor Technology for Nano-Particulate Detection

Sang Young Son

University of Cincinnati

The design of a portable, integrated particulate detection sensor that will enhance sensor mobility and compatibility to respiratory population health studies remains a challenge. This study involves the innovative design of a micro-thermofluidic based airborne-particulate detection sensor. The high heat transfer rate and compactness of micro/minichannel multiphase flow system associated with phase change phenomena have been increasingly attractive in microfluidic sensor development for applications, which demand small, light, and efficient systems. In order to detect airborne particulates in the nanometer range, heterogeneous nuclei condensation phenomena in micro/minichannels and microscale two-phase flow control technology are utilized to generate the condensate aerosol with micrometer range of size, which allows optical scanning. Experimental results of heterogeneous condensation on nanoparticles in microscale environments, fabricated by MEMS technology, outline the robust performance of portable thermofluidic sensors for nano-particulate detection.