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Determination of real-time particle monitor response to combustion derived particles under controlled experimental conditions.

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Real-time particle monitoring instruments are becoming increasingly popular in gauging the impacts of sources in indoor air quality studies. However, there have been several studies that indicate that some real time monitors over- or under-report particulate concentrations, relative to the benchmark standard of gravimetric respirable suspended particulate matter (RSP). The purpose of this study was to compare the response of several commercially available instruments to a variety of common matrices (environmental tobacco smoke (ETS), cooking fumes, wood smoke, and propane stove fumes) under controlled laboratory conditions. Smokes and fumes were generated inside or immediately outside a 30 m³ controlled experimental atmosphere chamber that was operated under static conditions. Simulated ETS was generated by mixing ca. 90% sidestream smoke and 10% mainstream smoke that had been bubbled through a water filled gas wash bottle. Typically, smoke or fumes were monitored for 4 hours, with concomitant collection of RSP and vapor phase markers (where appropriate). Monitors tested included three nephelometers (light scattering based) and one real-time PAH sensor. The TSI DusTrak, the most widely used instrument, had a relative response instrumental vs gravimetric RSP of 4.41, 2.25, 3.11, and 0.084, for ETS, cooking oil fumes, cedar wood smoke, and propane stove particles. In contrast, Dustrak's co-located with RSP samplers in hospitality venues, likely to contain a mix of particle sources, exhibited a relative response factor of 3.0.

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