The Developing of an Economic Laser Particulate Matter Sensor for Outdoor Air Quality Network Application

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Ambient particulate patter (PM) concentrations is a very important factor for air quality monitoring. For the quantifying the spatial and temporal variability of ambient PM concentration, a large quantity and economic PM sensor must be developed. Compared with the Indoor PM sensor which is widely used in air purifier, HVAC etc., the challenges for the outdoor PM sensor are: PM10 testing precision, changeful size distribution and the wide temperature range from -40-70°C etc. this work introduces the recent developed PM4000 laser PM sensor for outdoor air quality network application. In PM4000, a more powerful parallel laser source, a smaller gas flow nozzle and a miniature gas turbo fan had developed, it solves the problem of low particle counting number of PM10 because of the low gas flow, the cross-talking between PM1.0 and PM2.5 to PM10 because of the simple optical design for cost consideration which happened in indoor laser PM sensor. Additionally, different kinds of PM generator such as cigarette smoking, A1, mixing of cigarette smoking and A1 and potassium chloride aerosols (Kcl), with different particle size distribution had used for the calibration of this sensor. An optimal calibration algorithm had developed based on the smart detection of particle types.to decrease the temperature effect, a “matrix calibration” with mass concentration from 0-500ug/m3 and temperature range from -40 to 70°C in a 3m3 calibration room had conducted. The field testing of PM4000 had evaluated compared with the Grimm (optical particle counting) and Metone (US EPA certificated Beta-ray type). The results of this work show the PM4000 can be used for detection pf PM2.5 and PM10 for outdoor air quality network application.