



“Gheorghe Asachi” Technical University of Iasi, Romania



STUDY ON CALIBRATION TECHNOLOGY OF CONDENSATION PARTICLE COUNTER FOR PARTICLE POLLUTANT MEASUREMENT FROM VEHICLE EMISSION

Guo Li-Xu¹, Liu Jun-Jie^{2*}, Liu Yue², Xiao Ji², Ren Jun¹, Xu Xiao²

¹Taiyuan University of Technology, 030024 Taiyuan, China

²Environmental Metrology Center, National Institute of Metrology, 100013 Beijing, China

Abstract

As the main source of PM_{2.5} pollutions in the ambient air, pollutant from heavy-duty and light-duty vehicle emission have gradually been concerned. The control of particulate matter emission and the accurate measurement of the particle number concentration have become one of the main measures for PM_{2.5} improvements. For promoting the reliability and decreasing uncertainty of traditional calibration method for condensation particle counter (CPC) which is widely used in vehicle emission measurement, a high-precision aerosol electrometer is firstly developed, which can measure aerosol samples accurately at larger than 3700 particles cm⁻³ with relative uncertainty better than 1.6% ($k=2$). Meanwhile, an accuracy calibration method for aerosol diluter based on quantitative aerosol generation (QAG) technology was developed. Therefore, on this basis, by accurately diluting the high concentration aerosol sample and comparing with the high-precision aerosol electrometer, the CPC calibration could be achieved in the range above 30 particles cm⁻³ with relative uncertainty better than 4.0% ($k=2$). By using the developed calibration method, particle counting efficiency of CPC in single particle counting mode could be evaluated, and traceability and reliability of particle number concentration measurement data for vehicle emission could be ensured.

Key words: aerosol electrometer, calibration, concentration, condensation particle counter, vehicle emission

Received: June, 2023; *Revised final:* September, 2023; *Accepted:* December, 2023; *Published in final edited form:* May, 2024

* Author to whom all correspondence should be addressed: e-mail: liujj@nim.ac.cn