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**A new particle counter for measuring non-volatile particle number concentration and the EC/TC ratio of combustion PM emissions****Longfei Chen**

Beihang University, China

This paper reports a new non-volatile condensation particle counter (nv-CPC) operating at high temperature up to 300°C, at which volatile organic compounds (VOCs) and water are in gaseous phase. Hence, the nv-CPC counts the number concentration of only non-volatile particles which are less susceptible to dilution conditions. VOCs may experience coagulation, condensation and adsorption in the dilution plume and thus are highly sensitive to dilution conditions. Therefore, the conventional CPC inevitably suffers higher uncertainties than the nv-CPC due to VOCs presence. To achieve a reproducible measurement of particle number, the EU initiated the particle measurement program (PMP) which specified a volatile particle remover (VPR) be used prior to particle counter to mitigate the VOCs artifacts. The controversial cut-off size and incomplete VOCs removal issues trigger the need to re-consider the methodology. The nv-CPC was calibrated based on the PMP protocol and was compared with the conventional CPC by challenging different monodisperse particles screened via an electrical classifier. The nv-CPC size spectra were largely stable regardless of pre-process and dilution conditions for raw sample gas, while the CPC size spectra exhibited higher uncertainties. The parallel arrangement of the CPC and the nv-CPC also facilitates the on-line determination of size-resolved elemental carbons/total carbons (EC/TC) ratios on particle number basis, which is more useful than the bulk EC/TC ratios measured by off-line filter-based technique. The distinction of PM emissions from a modern aero-engine under two different combustion modes, were well characterized by using both particle counters in tandem.

chenlongfei@buaa.edu.cn

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