

Reference aerosols for PTI-PN counters

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Particle emissions in exhaust gases from motor vehicles are progressively being determined with number-based measuring instruments. Since July 2023 the measurement of the number concentration in the exhaust at the tailpipe is mandatory during periodical technical inspection in Germany [1]. For this purpose several measurement devices based on the technology of either condensation particle counters (CPC) or diffusion charge particle counters (DC) were developed. These measuring devices require periodic calibration against a reference system employing test aerosols.

Due to the fact that the signal from DC-detectors correlates to the aerosol length concentration but not to the number concentration, it depends on the particle size. Therefore, the test aerosols required for calibration have to be well-defined in terms of size distribution, particle shape and material. All required properties are specified in the "AU-Geräte Kalibrierrichtlinie" (German exhaust emission test equipment calibration guideline [2]). Typically, these test aerosols are produced by Collison-type atomizers employing saline solutions. Therefore, the humidity of the generated test aerosol has to be controlled to prevent the abrupt increase of particle size at the deliquescence point. This effect is illustrated in Fig. 1 and 2. The contribution discusses solutions for aerosol conditioning, which are technically and economically suitable for mobile calibration purposes.

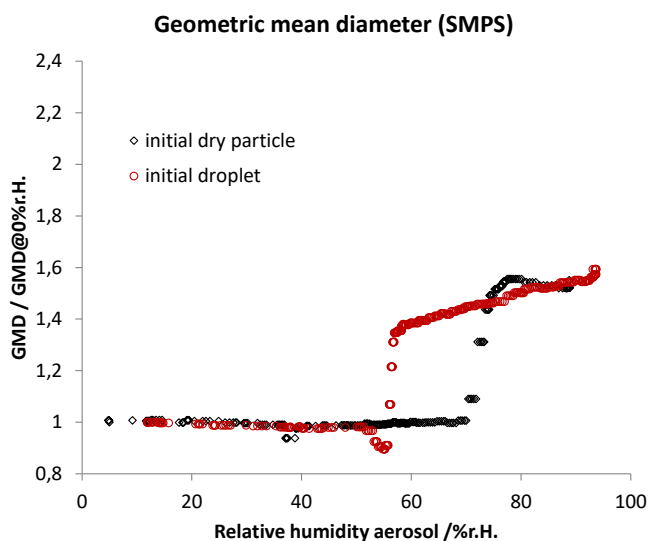


Fig. 1: Increase of geometric median diameter of test aerosol compared to the initial value at 0%r.H.

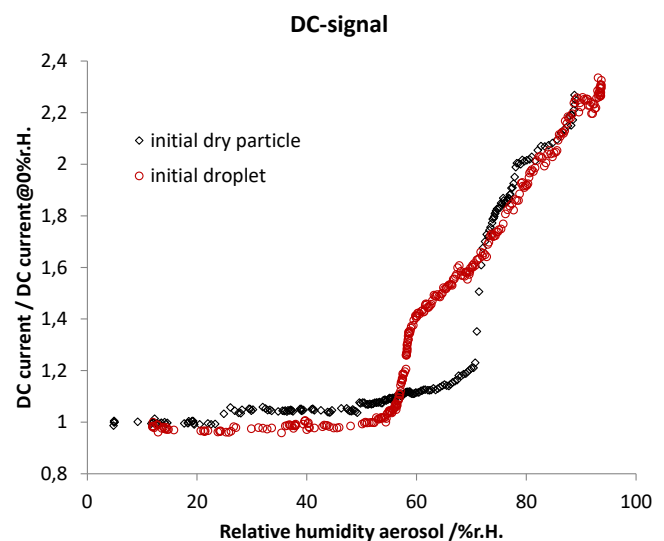


Fig. 2: Increase of the diffusion charge particle counter (DC) signal compared to 0%r.H.

- [1] Amtsblatt des Bundesministeriums für Digitales und Verkehr der Bundesrepublik Deutschland Nr.73/2023 vom 08.05.2023, Verkehrsblatt Nr.11/2023
- [2] Richtlinie zur Kalibrierung von Abgasmessgeräten, die für die Untersuchung der Abgase von Kraftfahrzeugen nach Nummer 6.8.2 der Anlage VIIIa StVZO eingesetzt werden ("AU-Geräte Kalibrierrichtlinie")