The new UFP 330: Sample conditioning

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Submicron particles belong to the most problematic pollutants in ambient air especially in urban areas. In contrast to other species the concentration of these particle fraction has increased in recent years.

Basing on their ability to reach the deep lung and even to enter body tissue submicron particles show adverse health effects. This dose-relationship seems to be particularly evident for particles smaller than 1 µm (Peters, 1997).

Currently the particulate matter in ambient air is quantified by the mass concentration of different particle size fractions like PM10 or PM2.5. Shifting this upper cut to lower sizes towards ultrafine particles is not possible due to the lack in both highly sensitive mass detection methods and in suitable separation methods.

One possible solution of the problem can be the measurement of the number concentration. In the past this has been done by many groups adapting highly sensitive particle counters to the requirements of routine measuring networks. A suitable commercial device for this purpose has not been available up to now.

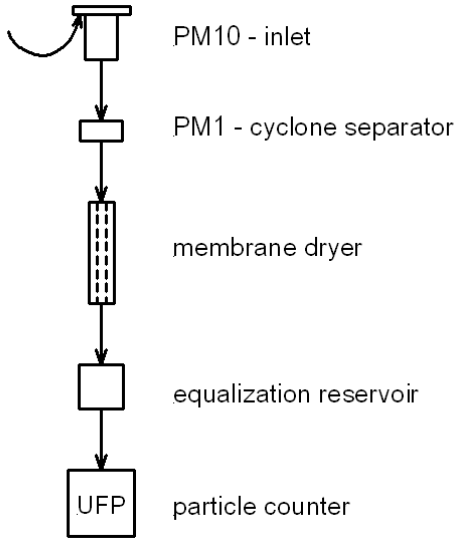

Figure 1. Sampling system for aerosol spectrometers

In the European project UFIPOLNET a new particle spectrometer has been developed making a trade-off between the required accuracy of the results and the suitability for field use. This includes on the one hand rough environmental conditions and on the other hand a low maintenance effort.

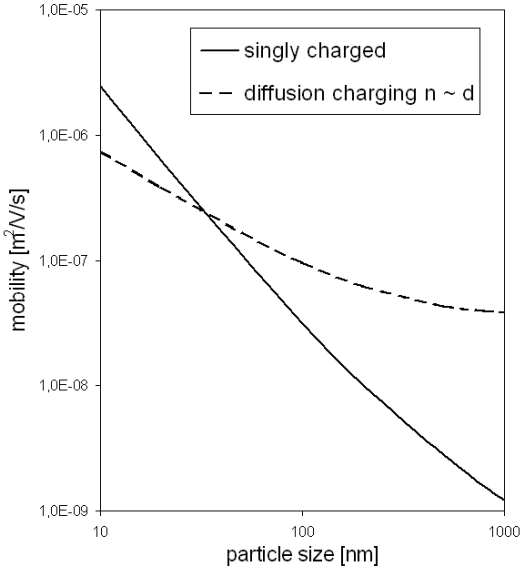

Figure 2. Relation between particle size and electrical mobility using a diffusion-based charger.

One important part of the newly developed spectrometer is the sampling system being substantially different from systems used for gaseous or particle mass sampling. Its main function is the separation of particles exceeding the working range of the device. Due to the used diffusion charging process coarse particles would otherwise interfere the measured mobility spectrum.

Furthermore it includes a dryer to reduce humidity in the sampled aerosol and a equalization tank to average dynamic concentration peaks. The measured particle number concentrations have to be corrected for the transmission efficiency of this components. This data will be presented in detail.

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A. Peters et al. Respiratory effects are associated with the number of ultrafine particles (1997), *Am J Respir Crit Care Med*, 155, 1376-1383.