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Unobtrusive UFP sensors for indoor applications

Indoor aerosols typically receive far less attention than outdoor aerosols, which are being permanently monitored in measurement networks. Air quality guidelines are also made for outdoor air quality, even though most people spend most of their time indoors, and although indoor air quality can be much worse than outdoor air quality in some circumstances. Therefore, even though a large part of the health burden through air pollution such as UFP comes from the time we spend indoors, we know little about those exposures.
One reason that we know so little about indoor UFP exposures is due to the complexity of making indoor air quality measurements. While there have been many studies with –often large numbers of - laboratory-grade instruments, such measurement campaigns are complex and expensive, and the measurements with a large number of big and noisy instruments is a nuisance for the building occupants. We spend a lot of time asleep in the bedroom, where obviously complex and noisy instruments cannot be used, as they would disturb the sleep of the occupants.
At naneos, we have developed UFP sensors which are small, comparatively cheap and importantly for indoor measurements, nearly silent. We use pumps that operate at 21 kHz which are not audible for most humans, except for children. The high frequency sound can also be muffled easily with an enclosure, much more easily than lower frequencies. Our sensors are based on particle charging followed by electrical detection. Compared to more traditional nanoparticle detectors like condensation particle counters, there is no need for a working fluid such as Butanol, so there is also no need to remove any noxious vapors. Two specific sensors are of particular interest for indoor aerosol measurements:
1) The Partector 2 pro measures a rough particle size distribution (8 channels, 10-300nm) from which e.g. particle number or average particle diameter can be calculated. The knowledge of the temporal evolution of particle size distributions indoors can help to identify sources based on their typical size spectrum.
2) The OEM LDSA sensor (OLS) measures lung-deposited surface only, but has been designed to be more robust, need less service and be much cheaper than the Partector 2. With the OLS, UFP measurements become a lot less expensive and can thus be performed on a much larger scale than was previously possible.
Both instruments can be combined with internet connectivity, so that setting up an indoor aerosol measurement campaign is only a matter of minutes.
We will present data from multi-week measurement campaigns we have made with our sensors in 3 Swiss homes.

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