Portable device for simultaneous measurements of Nano particles and it agglomerations at workplaces

H. Grimm[1], M. Pesch[2], M. Richter[3], A. Comouth[4]

Grimm Aerosol Technik GmbH & Co. KG, 83404 Ainring, Germany
Keywords: aerosol instruments, Nano particles, particle size distributions, work place measurements
Presenting author email: mp@grimm-aerosol.com

Measurements of particle size distributions for Nano particles and particles in the µ-meter size range generally requires a combination of separated devices as SMPS and optical particle counters (OPC) or aerodynamic particle sizers (APS). Especially the SMPS is complex, quite heavy and not always easy to use. This technique generally needs a radioactive source as Kr85 or AM241 for a well defined charging equilibrium of the aerosols that reduces flexibility at workplaces.

The company GRIMM developed in the frame of the EU founded Project NANODEVICE a new compact and portable device that consists of an electrical and an optical aerosol sensor. The device allows the simultaneous measurements of Nano particles and it agglomerations: it allows particle size detections between 10 nm and 25 µm with 42 size channels. The time resolution of one complete scan is 1 minute. The system is compact, easy to use and does not need any consumables. A radioactive source is not required.

Figures 1 and 2 demonstrate measurements that have been carried out at workplaces. The objective of the measurements shown is number, size and mass of particles caused by soldering processes.

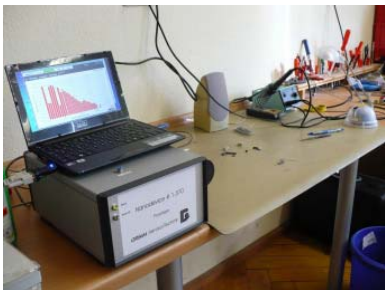

Figure 1: Measurements at workplaces, determination of background concentration

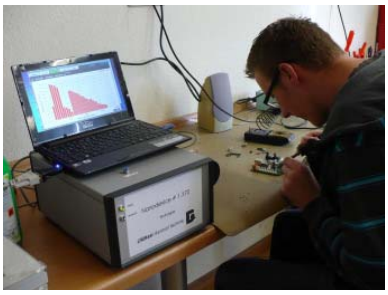

Figure 2: Measurements at workplaces, determination of all particles caused by soldering

An example measurement results is shown in figures 3 and 4. The soldering process has caused a high increase of very small Nano particles. These particles are mainly caused by condensation processes of volatile components: Figure 3 shows that during soldering between 15:28 and 15:29 total concentration of Nano particles exceeded concentrations of 350,000 particles/cm³ whereas the background concentration was less than 10,000 particles/cm³. The size distribution has shown that these particles are mainly in the range of 15 nm to 20 nm.

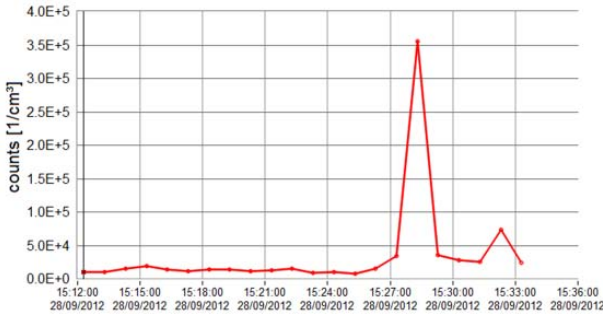

Figure 3: Number concentration of particles during soldering

An interesting point is the distribution of particle masses during soldering. The mass is determined by the particles caused by the soldering process size range from 15 nm to 40 nm but also by particles larger than 2 µm (figure 4). These large particles have been formed by agglomeration processes of primary Nano sized particles. A small amount was also caused by the background concentration.

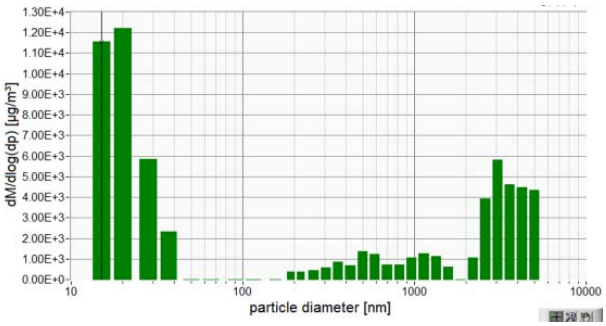

Figure 4: Mass distribution of particles during soldering