Personal exposure to particulate matter during grinding of dental nanocomposite

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During abrasive operations in dental offices, particles of different sizes are released into the air. Currently used dental composites may contain 50 – 70 % of nanosized filler particles. There is a serious concern that medical staff could inhale nanoparticles during composite procedures and that this could have a negative effect on their health. 24 participants were exposed to aerosol particles during four dental nanocomposite grinding experiments (6 participants per experiment). Novel active personal nanoparticle samplers (PENS, PM4-0.1 and PM0.1) were used to determine personal exposure, and the results were compared with the data from a Berner Low Pressure Impactor (BLPI, 10 size fractions in the range 0.026 – 13.7 µm) and a tandem of online instruments including a Scanning Mobility Particle Sizer (SMPS) and an Aerodynamic Particle Sizer (APS) measuring in the size range 0.01 – 20 µm.

Time behaviour of number concentrations of the respirable fraction (PN4) and nanoparticles (PN0.1) measured by the SMPS/APS tandem is shown in Fig. 1. The results revealed that grinding nanocomposite material is a significant source of respirable particles including nanoparticles in the indoor air. Both fractions showed increase at the beginning of the nanocomposite grinding round, with maxima achieved at the end of grinding round, and followed by subsequent decrease to background values.

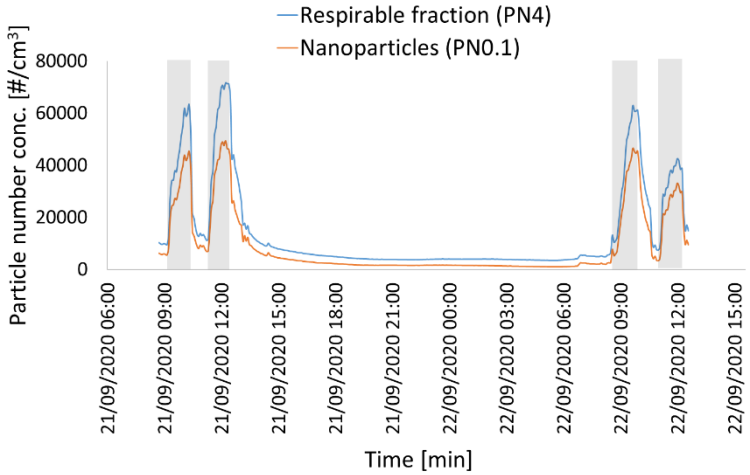

Fig. 1: Time behaviour of number concentrations of the respirable fraction (PN4) and nanoparticles (PN0.1) concentrations (grey coloured areas represent individual grinding rounds)

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