

Detection of catalytically active nanoparticles against a background of general workplace aerosols

Workers involved in the production or handling of engineered nanoparticles are likely to be at a high exposure risk. The isolation of this additional contribution to the total background particle concentration at the workplace still remains a challenge. Especially small particles can quickly attach to the background aerosol of the workplace due to coagulation. Because of the resulting disappearance in the size distribution, the existing on-line measurement devices are not capable to discriminate them from the background of the workplace. Thus, we developed a new measurement technique based on catalysis for the material-specific detection of metal nanoparticles such as palladium, nickel, platinum or metal oxides, e.g. iron oxide. Suitable catalytic test reactions were chosen and investigated for their suitability. The catalytic activity of the particles was measured on-line by infrared spectroscopy. We studied the catalytic behaviour of the particles directly after their production by spark discharge as well as in presence of a background aerosol. The experiments showed the suitability of our technique for the detection and quantification of the catalytically active particles with a high sensitivity. Only a few micrograms or even nanograms of the catalytically active material are required. Besides, the method enables the discrimination of catalytically active particles from a non-active background aerosol in (quasi) real-time. The used setup is already a compact and portable version which allows measurements directly at workplaces.

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