

Workers exposure to carbon black dust containing nano-sized particles.

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Aim of communication

Carbon black is a material the most commonly used in the rubber industry, but also as black pigment in inks, toners, paints and plastics. This material is highly formed of almost pure carbon. This is the most commonly used nanomaterial - the size of individual particles of carbon black is ranged from 20 nm to 100 nm, depending on the type of carbon black. The diameter of aggregates formed by the carbon black particles is ranged from 50 nm - 600 nm. In selected researched was shown that inhalation of carbon black can cause the changes in the respiratory system if exposed workers. The aim of present study was to assess the number, surface area and mass concentration, of ultra-fine particles during the pouring and packing of carbon black.

Methods

The measurements were carried out at the carbon black plant before the work shift, during the pouring and packing of material and after the work.

Following devices were used during the measurement cycle:

- Condensation Particle Counter (TSI model 3007-2) - to determine the number of particles concentrations
- AeroTrak 9000 (TSI) – to determine the surface area concentrations of the particles potentially deposited in the alveolar (A) and tracheo-bronchial (TB) region of lungs
- DustTrak (TSI model 8534) - to determine size segregated mass fraction

Air samples were collected for 16 minutes each sample at a height of 1.5 m from the ground in the breathing zone of workers.

Results

The average concentration of ultra-fine particle number found during the pouring and packing of carbon black was 14203 particles/cm³ and increased by 37.5% compared to the concentration before the start of the analysed process. The surface area concentration of the particles, potentially deposited in the region A was 223 μm²/cm³ during the activity and increased by 21.6% compared to the concentration before. In the case of TB fraction the values were 78.8 μm²/cm³ during the work and 10.4% of the increase before it begins. Total mass concentration of the particles was 1.45 mg/m³ during the

analysed process, and before the activity this value was 0.11 mg/m³, which indicates an increase of 7.6%.

Conclusions

- Number concentration of particles smaller than 1000 nm released in the process under study was more than 2 - fold higher compared to the value before the activity.
- The surface area concentration of the particles was 5-fold higher in the case of particles possibly deposited in a region A, and 9 - fold higher the TB region.
- Mass concentration of particles released during the activities of packing and pouring of carbon black was 13-fold higher than before the work shift.
- Pouring and packaging carbon black associated with significant increase in mass, number and surface area of particles and should be considered as a potential harmful factor

The nano-sized particles are important factor in exposure assessment of workers involved in the process of pouring and packing of carbon black.

In the analysed process the increase in the parameters characterizing the carbon black dust was observed.

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