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Characterization of nanoparticles in photocatalytic and regular cement using an aerosolizing nanoparticle generator system

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Nanotechnology has been implemented in the construction industry and one application is the use of photocatalytic cement which is Portland cement containing titanium dioxide (TiO2) nanoparticles. Photocatalytic cement makes the surface white without the need of paint. TiO2 acts as a biocide making the surface self-cleaning.
However, TiO2 is a human carcinogen (Group 2B; IARC) and construction workers are exposed to airborne particles while handling cement. The deposition of inhaled particles is influenced by physical and chemical properties such as particle size and density, shape and penetrability, surface area, electrostatic charge, and hygroscopicity. Portland cement is well characterized fine powder with an aerodynamic diameter in the range of 0.05-5 μm. Photocatalytic cement has not previously been described in terms of physical characteristics and chemical composition. This cement might have a smaller aerodynamic diameter, changing the lung deposition mechanisms from that of regular cement. Nanoparticles have been shown to accumulate in the lungs, especially in the alveoli, and be translocated into blood circulation where they are transported to different target organs (lymph nodes, kidney, liver, heart, and brain). Physical parameters for cement can be obtained using an aerosolizing nanoparticle generator system. Our research aims are to (1) characterize photocatalytic cement and (2) compare the parameters to regular cement using this aerosolizing system.

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