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PHYSICO-CHEMICAL AND TOXICOLOGICAL BEHAVIOUR OF Al_2O_3 NANOPARTICLES IN FINE PARTICULATE MATTER

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Abstract

The booming production and application of nanoparticles have raised great concern over its effect on environment, due to their increasing release in the environmental systems via intentional or unintentional activities, where their possible physicochemical and toxicological behavior remain unknown. The nanoparticles are released into the different environmental systems like air, soils and waters. However, their interaction with air matrices has been rarely investigated. For this reason, the changes of main physicochemical properties of Al_2O_3 nanoparticles in the presence of fine particulate matter were examined, as well as their toxicity towards gram-negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*) and gram-positive bacteria (*Bacillus subtilis* and *Staphylococcus aureus*) using colony counting method was assessed in the presence of fine particulate matter. *E. coli* and *B. subtilis* were the most strongly affected species by the Al_2O_3 nanoparticles under the influence of fine particulate media. Furthermore, the main physicochemical properties (particle size, zeta potential, and surface chemistry) were changed with the exposure of the fine particulate matter. Sulfone groups were detached and nitro groups were attached on nanoparticles surface according to FTIR analysis. Particle size of Al_2O_3 was decreased with the correlation of zeta potentials. This is one of the rare study to evaluate the effect of fine particulate media on Al_2O_3 nanoparticles with the respect of the physicochemical properties and toxicity of Al_2O_3.

Key words: Al_2O_3, bacterial inhibition, nanoparticle toxicity, $PM_{2.5}$, physicochemical transformation

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