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The fate, behavior and effect of WO₃ nanoparticles on the functionality of an aerobic treatment unit**S Simelane, J C Ngila and L N Dlamini**
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As a promising organic photocatalyst in wastewater treatment, understanding the fate and behavior of the WO₃ nanoparticles and its impact on the functionality on the treatment plant is of paramount importance for accurate toxicological risk assessment. This was achieved through acclimatization of activated sludge to the simulated wastewater treatment plant operated according to the Organization for Economic Co-operation and Development 303A guidelines. During acclimatization, chemical oxygen demand (COD), and a five-day biological oxygen demand (BOD₅) were monitored. Humic acid impact on the functionality of the domestic waste water treatment plant was investigated as it is a major constituent of wastewaters. The COD removal was above 80% suggesting that humic acid had no impact on the activated sludge activity. The fate of *m*-WO₃ was monitored using X-ray diffraction and scanning electron microscope coupled with electron dispersive x-ray. X-ray diffraction analysis showed presence of *m*-WO₃ in the sludge which was further confirmed with electron dispersive x-ray -mapping which showed presence of tungsten signifying adsorption of the nanoparticles on the sludge. Up-to the addition of 15 ppm WO₃ showed to have an effect on functionality of the treatment plant as the COD removal dropped to 70% which is below the 80% stipulated guideline signifying adequate removal of the COD. This implies that WO₃ nanoparticles possess toxicity effects on the activated sludge. An increase in conductivity was observed in the test effluent suggesting the possibility of dissolution of the nanoparticle. The ICP-OES analyses showed that 80% of W was retained in the sludge while 20-21% m/m actually ran out with the effluent.

Biography

S Simelane obtained his BSc degree from the University of Swaziland (UNISWA), where he majored in Chemistry and Biological Science. Apart from his degree, he also holds certificates in human resource management, entrepreneurship, and introductory to wastewater treatment. He was then employed by Coca-Cola Swaziland as a Laboratory Chemists for a period of 17 months. His main role included method validation, equipment troubleshooting and preventative maintenance and analysis of incoming materials. While employed by Coca-Cola, he was also trained in ISO 17025 by SANAS. Being a person of excellence, and willing to expand his scientific knowledge, he pursued a higher degree in Chemistry. He is currently an MSc Chemistry student at the University of Johannesburg, where his research interest is on understanding the fate and behavior of engineered nanomaterials.

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