Comment on:

Olushola S, Olalekan S, Folahan A, Leslie F and Ximba BJ (2014) Application of nano zinc oxide (nZnO) for the removal of triphenyltin chloride (TPT) from dockyard wastewater (*Water SA* 40 (4) 659–664)

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In the previously published work by Olushola et al. (2014), the effectiveness of nano zinc oxide (nZnO) on the removal of triphenyltin chloride (TPT) from contaminated dockyard wastewater was demonstrated and the authors concluded that nZnO has good potential as an adsorbent for TPT in dockyard wastewater systems. However, there is no consideration of the presence of NOM and flow velocity in dockyard wastewater systems, with regard to developing competent adsorbents for the removal of TPT from wastewater for practical implementation.

Triphenyltin (TPT), an endocrine-disrupting compound, has been widely used as a major ingredient of fungicides, herbicides, pesticides and antifouling paint (Antes et al., 2011; Hobler et al., 2010; Zhang et al., 2008). When wastewater effluents containing TPT are discharged into our environment, it could cause several side effects to humans and aquatic organisms due to the potential toxicity of TPT at an environmentally relevant concentration to different non-target organisms (Rantakokko et al. 2010, Zhang et al. 2008). As an adsorbent to remove environmental organic pollutants, nZnO has been increasingly applied to water treatment systems because of predictable reaction kinetics and absorption capacity, accompanied by its low cost (Chen et al., 2008; Sayyadnejad et al., 2008). Accordingly, many environmental scientists have been interested in nZnO application for water quality improvement.

The experiments performed in the reported work by Olushola et al. (2014) were well-organized and described in detail. Olushola et al. (2014) emphasized in the abstract and conclusion that nZnO has good potential as an adsorbent for TPT removal from dockyard wastewater. This study would definitely be useful to develop a new type of competent adsorbent for water quality improvement. However, we would like to suggest further consideration (described below) for practical application, before concluding that nZnO, as used in this reported study, is an efficient adsorbent to remove TPT in dockyard wastewater systems.

Natural organic matter (NOM) is a trace organic matter which is a ubiquitous component of natural waters and a degradation product from microorganisms, animals and plants in the environment, via physical, chemical or biological processes (Summers and Roberts, 1988). The size, shape and composition of a molecule of NOM varies greatly. Since NOM is easily bound to metal ions and minerals due to its high reactivity (Buffle, 1989; LeBoeuf and Weber, 2000; Zhou et al., 2005), NOM plays an important role in adsorbing and transporting heavy metals and organic pollutants in natural or engineered environments. In wastewater, NOM exists at high concentrations (Katsoyiannis and Samara, 2007; Wei et al., 2010) and thus could interfere with the reaction between TPT and the tested nZnO. As it is also known that ionic strength and pH influence the charge and configuration of NOM, which control NOM adsorption (Summers and Roberts, 1988), the adsorptive force between NOM and nZnO should be considered with the measurement of these two water parameters. Thus, it is necessary to understand the complexity of the target organic pollutant's behaviour in the NOM–nZnO–pollutant (i.e., TPT) three-phase system, to evaluate the removal efficiency of the tested nZnO for TPT in wastewater.

The flow velocity in a wastewater treatment system is one of the influencing factors affecting the removal efficiency for a target pollutant (Gupta et al., 2011). Olushola et al. (2014) do not discuss the potential influence of flow velocity on the concentration and distribution of TPT on nZnO; TPT that may be loosely deposited on the nZnO surface could be re-suspended by hydraulic flow that occurs during hydrant flushing in a reactor. This implies that the distribution of TPT on nZnO may vary during the adsorption process according to the time of hydrant flushing, indicating that nZnO performance for TPT removal in a wastewater treatment system may be dependent on the operating conditions of a reactor. Thus, collecting flow velocity data should be considered to evaluate the performance of nZnO toward TPT removal in dockyard wastewater systems. We hope that this commentary will be useful in applying nZnO tested in Olushola et al. (2014) as a competent adsorbent to remove TPT in dockyard wastewater systems for practical purposes.

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In the published work by Ayanda et al. (2014), the potential of nano zinc oxide (nZnO) for the removal of triphenyltin chloride (TPT) from contaminated dockyard wastewater was investigated. The aims and objectives of the reported work are clearly stated. The effect of adsorbent dose, contact time, pH, stirring speed and temperature on the adsorption of TPT onto nZnO was investigated vis-à-vis the isotherm, kinetic, and thermodynamic aspects of adsorption.

The adsorption of TPT was carried out at laboratory scale, by the use of a batch adsorption technique. Hydrant flushing in a reactor is not related to the work reported by Ayanda et al. (2014). Hence, replicating the flow velocity in dockyard wastewater systems will certainly not be necessary in a batch adsorption experiment. A test for the flow velocity is essential for pilot studies and/or column experiments.

The influence of natural organic matter (NOM), as suggested by Do-Gyun Lee, is possible and important in a batch adsorption experiment. Our research group is currently looking into this and other experimens (pilot studies as well as column adsorption experiments).

Research is infinite; several conditions/parameters could be investigated in a single research. We have been able to demonstrate the potential of nZnO for the removal of TPT from contaminated dockyard wastewater on a laboratory scale. Other researchers are encouraged to replicate our study and/or continue building on this.

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