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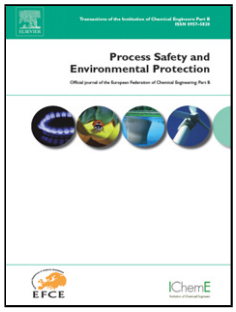

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ACCEPTED MANUSCRIPT

Synthesis of silica-functionalized graphene oxide/ZnO coated on fiberglass and its application in photocatalytic removal of gaseous benzene

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Highlights

- Silica-functionalized graphene oxide/ZnO composite was synthesized and characterized.
- Silica-GO/ZnO is coated on the fiberglass matrix through Si−O bonding.
- Silica-GO/ZnO/ fiberglass composite used as catalyst for photocatalytic degradation of gaseous benzene.
- The maximum activity of silica-GO/ZnO/ fiberglass for photocatalytic degradation of gaseous benzene was 87%.
- Relative humidity had dual effect on catalytic potential of silica-GO/ZnO/ fiberglass in degradation of gaseous benzene.

Abstract

Volatile organic compounds (VOCs) are a serious threat to public health, causing many serious diseases including cancer. Benzene is a VOC, causing different problems including aplastic anemia, acute leukemia, bone marrow abnormalities, and cardiovascular diseases in human who are exposed to it. Therefore, methods for degradation of benzene are required. In this study, for the first time silica-functionalized graphene oxide/ZnO (Silica-GO/ZnO) nano composite was synthesized and coated on fiberglass. It was then used for photocatalytic removal of benzene from the polluted air stream in a continuous reactor. The properties of the synthesized catalyst were examined by FTIR, XPS, XRD, SEM-EDX, N_2 adsorption–desorption isotherms, and photoluminescence (PL) analyses, all of which confirming presence of silica and zinc oxide nanoparticles on graphene oxide, suggesting that GO-SiO_2-ZnO photocatalyst was synthesized successfully. We investigated the effects of initial benzene concentration, flow rate, and humidity in degradation of benzene. The findings of this study indicated that the maximum removal efficiency of benzene was 87%. The range of optimal humidity for benzene removal

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