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### Viscose support for assembly of Cu<sub>2</sub>O and TiO<sub>2</sub>: Antimicrobial, photocatalytic, and recoverable composites for Cr(VI) removal

#### Abstract:

Biological consideration, with the effect of chromium, comes from its prominent impact on environmental pollution with a toxic effect on microbial organisms, plants, and mammals. High amounts of chromium are discharged into different environments via different industries such as dyeing and printing in textile industries, chemical manufacturing, leather tanning, and metal plating. The hexavalent chromium ion [Cr(VI)] is known to be 500 times more toxic compared to the Cr(III) cation. Herein, the removal of Cr(VI) from wastewater via antimicrobial or photocatalytically active composites was currently performed using Cu<sub>2</sub>O@viscose, TiO<sub>2</sub>@viscose, and Cu<sub>2</sub>O@TiO<sub>2</sub>@viscose. Whereas, for the first time, both Cu<sub>2</sub>O and TiO<sub>2</sub> as superior photocatalysts were exploited, to be impregnated within viscose as a supporting template, for the preparation of superior or recyclable products for broad, repetitive, and easier applicability. Viscose was preliminarily treated with Cu<sub>2</sub>O and TiO<sub>2</sub> metal precursors to prepare Cu<sub>2</sub>O@viscose, TiO<sub>2</sub>@viscose, and Cu<sub>2</sub>O@TiO<sub>2</sub>@viscose. The affinity for Cr(VI) removal is observed to follow the order: Cu<sub>2</sub>O@TiO<sub>2</sub>@viscose > TiO<sub>2</sub>@viscose > Cu<sub>2</sub>O@viscose > viscose. Thus, Cu<sub>2</sub>O@TiO<sub>2</sub>@viscose exhibits superior affinity for acting as a photocatalyst. Moreover, the highest percentage Cr(IV) removal was observed at 3.5 g/L as the photocatalyst dosage. The study of recoverability revealed that the Cr(VI) removal percentage was estimated to be 40% and 87% after one cycle, and was insignificantly decreased to 27% and 60% after five cycles for Cu<sub>2</sub>O@viscose and TiO<sub>2</sub>@viscose, respectively. Whereas, by exploitation of Cu<sub>2</sub>O@TiO<sub>2</sub>@viscose for Cr(VI) removal, the removal percentage was estimated to be 98% after one cycle and insignificantly decreased to 78% after five repeated cycles. In summary, Cu<sub>2</sub>O@TiO<sub>2</sub>@viscose was shown to have excellent antimicrobial performance and the highest affinity for chromium removal, with the highest recoverability.

#### Biography

**Omaymah Alaysuy** has completed her PhD at the age of 33 years from University of Leicester, UK and followed that with postdoctoral studies in project with British Sugar Company at University of Leicester. She is promoted to Associate Professor in October 2023 in Physical Chemistry at Faculty of Sciences and working in the role of General Supervisor of Scholarships Administration at University of Tabuk. She is interested in Green Chemistry and Materials Science Applications.