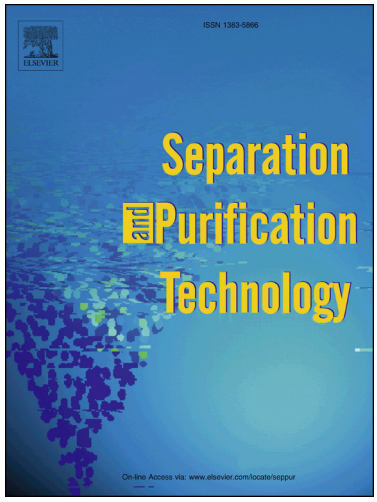

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Titanium-Zinc-Bismuth Oxides-Graphene Composite Nanofibers as High-Performance Photocatalyst for Gas Purification

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Abstract: Novel technologies have been on demand to develop improved photocatalyst for gas purification. Graphene has been used to improve the performance of photonic devices based on its high charge conductivity as well as other unique properties. Traditional approach uses discrete graphene sheets with sparse, sporadic deposition of semiconductor crystals (TiO_2) as photocatalyst, which results in poor light harvesting and electron-hole recombination at the sheet edges. In our novel configuration, the edge effect has been eliminated by having the graphene sheets being rolled into a "spiral" inserted in the 80nm TiO_2/ZnO/Bi_2O_3 (TZB) nanofiber, and free electrons can only travel unidirectional along the axis of the nanofiber. The nanofiber is fabricated with its surface packed with 10-nm sized TZB nanocrystallites that increases the surface area thereby improving light harvesting. Further, the addition of ZnO and Bi_2O_3 reduce the band-gap energy of the composite facilitating harvesting of the visible light spectrum. Other than fast transport of electrons to sites where photocatalysis is needed, the graphene roll (exposed in