Effectiveness of a newly synthesized graphene incorporated photocatalyst on degradation of Bisphenol-A and Ciprofloxacin in drinking water

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Abstract

Drinking water is used for many purposes starting from drinking to large food and beverage manufacturing processes. Therefore, it's safety and quality is a critical factor considering increasing of pollution of drinking water sources from various sources. Micro-pollutants are present in these sources leads to health issues among humans. Bisphenol-A (BPA) and antibiotic Ciprofloxacin are major micro-pollutant present in drinking water sources. In the present study, the effectiveness of newly developed graphene-based photocatalyst was tested against degradation of BPA and antibiotic (ciprofloxacin) in drinking water. Halogen lamp (lux=870) was used as the main light source. The powder form of the photocatalytic material was added to drinking water samples and exposed to sunlight. An aliquot was collected from each treatment at every ten minutes to determine the absorbance. Degradation behaviour was further studied by changing pH (5.4, 6.5, 7.3 and 8.2), initial concentration of BPA (from 5 mg/L to 20 mg/L), photocatalyst concentration (from 0.4 g/L to 2.0 g/L) and light source including sun light (from 11.00 a.m to 2.00 p.m), Halogen lamp (lux= 870), and UV lamp (254 nm). The results demonstrated that the highest degradation efficiency for BPA was achieved with 2.0 g/L catalyst concentration (95.5±0.20), 10 mg/L initial BPA concentration (95.70±0.73), pH 8.2 (92.60±2.85) and under visible light sources (95.7±0.73). Ciprofloxacin degradation was effective at 1.0 g/L catalyst concentration (98.13±0.12), with halogen light (97.56±0.12), and sunlight (96.38±0.19). Photocatalytic material was effective in basic pH value compared to neutral and acidic pH values of the drinking water. Compared to UV light, the tested material degrades BPA and Ciprofloxacin above 92% in drinking water samples under visible light. Therefore, graphene-based photocatalyst developed in this study is a nano compound that can be applied to degrade harmful BPA and ciprofloxacin in drinking water sources.

Keywords: Bisphenol-A (BPA), Ciprofloxacin, Graphene-based photocatalytic material

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