Evaluation of the adsorption capacity of nano-graphene and nano-graphene oxide for xylene removal from air and their comparison with the standard adsorbent of activated carbon to introduce the optimized one

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Abstract

Introduction: Volatile organic compounds from industrial activities are one of the most important pollutants released into the air and have adverse effects on human and environment. Therefore, they should be removed before releasing into atmosphere. The aim of the study was to evaluate xylene removal from air by nano-grapheme and nano-graphene oxide in comparison with activated carbon adsorbent.

Material and Method: After preparing adsorbents of activated carbon, nano-graphene, and nano-graphene oxide, experiments adsorption capacity in static mode (Batch) were carried out in a glass vial. Some variables including contact time, the amount of adsorbent, the concentration of xylene, and the temperature were studied. Langmuir absorption isotherms were used in order to study the adsorption capacity of xylene on adsorbents. Moreover, sample analysis was done by gas chromatography with Flame Ionization Detector (GC-FID).

Results: The adsorption capacities of activated carbon, nano-graphene oxide and nano-graphene for removal of xylene were obtained 349.8, 14.5, and 490 mg/g, respectively. The results of Scanning Electron Microscope (SEM) for nano-graphene and nano-graphene oxide showed particle size of less than 100 nm. While, the results of Transmission Electron Microscope (TEM) showed particle size of 45nm for nano-graphene and 65 nm for nano-graphene oxide. Also, X-Ray Diffraction (XRD) showed cube structure of nano-adsorbents.

Conclusion: In constant humidity, increase in exposure time and temperature caused an increase in the adsorption capacity. The results revealed greater adsorption capacity of xylene removal for nano-graphene compared to the activated carbon, and nano-graphene oxide.

Key words: *Activated Carbon, Adsorption, Nano-Graphene, Nano-Graphene Oxide, Xylene*

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