Synthesis of Cu-BTC@Fe_3O_4 nanocomposites for removal of arsenic from water followed by electrothermal atomic absorption spectrometry determination

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Arsenic is one of the toxic heavy metals, which is found in soil, air and water resources [1,2]. Arsenic contamination can cause serious health problems, including skin damage, heart, liver, bladder cancer and death [3,4]. World Health Organization (WHO) and the Environmental Protection Agency (EPA) classified arsenic as the first priority contaminant among hazardous substances and declared that the limit of arsenic concentration for drinking water is less than 10 ppb. Accordingly, several technologies have been developed to eliminate arsenic from drinking water including reverse osmosis, chemical coagulation, membrane filtration, ion-exchange, and adsorption methods. Because of its robust usage, high efficiency, and cost effectiveness, adsorption proved to be one of the most promising efficient remediation techniques for As removal. A wide range of adsorbents, including boehmite, alumina, activated carbon, hydrated ferric oxide, fly ash, clays, chitosan resins, activated alumina and cation-exchange resins have been reported for arsenic removal. However, most of the established adsorbents have many limitations such as unsatisfactory capture capacity, slow kinetics, and poor selectivity increasing the need for new efficient adsorbents. In this work, Cu-BTC@Fe_3O_4 nanocomposites was synthesized by growing H_3BTC thin layers joined by carboxyl groups onto Fe_3O_4 nanoparticles for removal of arsenic from water. The prepared sorbent was characterized using X-ray diffraction (XRD), vibration sample magnetometer (VSM), scanning electron microscopy (SEM) and Fourier transform infrared (FT-IR) techniques. Several factors that may affect the adsorption process, including sample pH, sorbent amount and adsorption time were optimized. The adsorption isotherm indicated that As adsorption fitted best to the Freundlich isotherm model and the maximum adsorption capacity was 91.32 mg/g.

Keywords: Cu-BTC@Fe_3O_4 nanocomposites, Removal, Arsenic

References

[1] AA Ensafi, N Kazemifard, and B Rezaei, *Biosens Bioelectron*, **2016**, 77, 499.
[2] TJ Kim, KA Kim, and SH Jung, *Sensors Actuators*, **2017**, 247, 520.
[3] S Flanagan, R Johnston, and Y Zheng, *Bull World Health Organ*, **2012**, 90, 839.
[4] E Dopp, LM Hartmann, AM Florea, and et al, *Toxicol Appl Pharmacol*, **2004**, 201, 156.