Removal of secbumeton herbicide from water on composite nanoadsorbent

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\textbf{ABSTRACT}

Water contamination by organic pollutants is a major problem. Secbumeton herbicide is a toxic pollutant and contaminates our water resources. Composite nanoadsorbent was prepared, characterized, and used for the removal of secbumeton from water by adsorption process. Secbumeton in water was analyzed by GC–MS under validated conditions. The optimized adsorption parameters were 30.0 μg/L concentration, contact time 30.0 min, pH 7.0, dose 2.5 g/L, and temperature 20.0˚C, with 90% as removal capacity. The adsorbent was selective with respect to secbumeton. The results followed Langmuir, Freundlich, and Temkin models. The values of thermodynamic parameter i.e. $\Delta G^\circ$ were $-5.89$, $-5.81$, and $-5.71$ kJ/mol at 20, 25, and 30˚C temperatures. The value of $\Delta H^\circ$ was $-11.08$ kJ/mol, indicating exothermic nature of adsorption. $\Delta S^\circ$ value was $-1.78 \times 10^{-2}$ kJ/mol K; an indication of entropy decrease during adsorption. Kinetic modeling showed pseudo-second-order and liquid film diffusion mechanisms. The developed adsorption method was fast, eco-friendly, and economic as may be used at pHs of natural water bodies with low contact time and dose. This method may be used for the removal of secbumeton from any water body at large scale economically.

Keywords: Adsorption of secbumeton; Adsorption isotherms; Water treatment; GC–MS; Composite nanoadsorbent; Mechanisms of adsorption

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