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Comparison Methyl Orange and Malachite Green Dyes Removal by GO, rGO, MWCNT, MWCNT-COOH, and MWCNT-SH as Adsorbents

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Abstract : Graphene oxide (GO), reduced graphene oxide (rGO), multi-walled carbon nanotubes MWCNT), multi-walled carbon nanotube functionalized carboxyl (MWCNT-COOH), and multi-walled carbon nanotube functionalized thiol (MWCNT-SH) were used as efficient adsorbents for the rapid removal two dyes methyl orange (MO) and malachite green (MG) from the aqueous phase. The impact of several influential parameters such as initial dye concentrations, contact time, temperature, and initial solution pH was well studied and optimized. The optimize time for adsorption process of methyl orange dye on GO, rGO, MWCNT, MWCNT-COOH, and MWCNT-SH surfaces were determined at 100, 100, 60, 25, and 60 min, respectively and The optimize time for adsorption process of malachite green dye on GO, rGO, MWCNT, MWCNT-COOH, and MWCNT-SH surfaces were determined at 100, 100, 60, 15, and 60 min, respectively. The maximum removal efficiency for methyl orange dye by GO, rGO, MWCNT, MWCNT-COOH, and MWCNT-SH surfaces were occurred at optimized pH 3, 3, 6, 2, and 6 of aqueous solutions, respectively and for malachite green dye were occurred at optimized pH 3, 3, 6, 9, and 6 of aqueous solutions, respectively. The effect of temperature showed that adsorption process of malachite green dye on GO, rGO, MWCNT, and MWCNT-SH surfaces were endothermic and for adsorption process of methyl orange dye on GO, rGO, MWCNT, and MWCNT-SH surfaces were endothermic but while adsorption of methyl orange and malachite green dyes on MWCNT-COOH surface were exothermic.On increasing the initial concentration of methyl orange dye adsorption capacity on GO surface was decreased and on rGO, MWCNT, MWCNT-COOH, and MWCNT-SH surfaces were increased and with increasing the initial concentration of malachite green dye on GO, rGO, MWCNT, MWCNT-COOH, and MWCNT-SH surfaces were increased.

Keywords : adsorption, graphene oxide, reduced graphene oxide, multi-walled carbon nanotubes, methyl orange, malachite green, removal
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