The influence of carbonization temperature on the modification of TiO$_2$ in the removal of methyl orange from aqueous solution by adsorption

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Received 13 July 2015; Accepted 11 September 2015

**ABSTRACT**

This work investigated the adsorption ability of unmodified and carbon-modified TiO$_2$ nanoparticles for the removal of methyl orange (MO) from aqueous solution. Carbon–TiO$_2$ was obtained by carbonization of ethanol vapors at three different temperatures (200, 300, and 400˚C), and their adsorption was compared with unmodified TiO$_2$ nanoparticles. The Freundlich adsorption model was found to fit for TiO$_2$ and C–TiO$_2$-200, while carbon modification of TiO$_2$ at a high temperature fitted the Langmuir–Freundlich model (C–TiO$_2$-300 and C–TiO$_2$-400). Generally, the carbonization of C–TiO$_2$ increased the adsorption capacity of TiO$_2$ nanoparticles, however the BET surface of modified and pristine TiO$_2$ was almost the same. The zeta potential of modified TiO$_2$ is higher than unmodified TiO$_2$, which leads to efficient adsorption of MO onto modified TiO$_2$.

**Keywords:** Methyl orange; Dye; TiO$_2$; Carbon modification; Zeta potential; Adsorption