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The influence of carbonization temperature on the modification of TiO_2 in the removal of methyl orange from aqueous solution by adsorption

Shila Jafari[a,*], Bahareh Yahyaei[b], Ewelina Kusiak-Nejman[c], Mika Sillanpää[a]

[a]*Laboratory of Green Chemistry, LUT Chemistry, Lappeenranta University of Technology, Sammonkatu 12, FI-50130 Mikkeli, Finland, Tel. +358 504 332 348; email: Shila.jafari@lut.fi, shila.sanaz.jafari@gmail.com (S. Jafari), mika.sillanpää@lut.fi (M. Sillanpää)*
[b]*Faculty of Chemistry, Department of Physical Chemistry, Bu-Ali Sina University, Hamedan, Iran, email: bahareh.yahyaei@gmail.com*
[c]*Szczecin Institute of Inorganic Technology and Environment Engineering, West Pomeranian University of Technology, Szczecin, Poland, email: ewelina.Kusiak@zut.edu.pl*

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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

*Corresponding author.