Application of heterogeneous iron loaded zeolite A catalyst in photo-Fenton process for the removal of safranin in wastewater

The current work evaluates the capability of iron loaded zeolite A (Fe-Z4A) for the first time as a heterogeneous catalyst in the (Fe-Z4A/H$_2$O$_2$/UV) photo Fenton process, Fenton process (Fe-Z4A/H$_2$O$_2$) and photo-catalytic process (Fe-Z4A/UV) for the treatment of textile dye safranin. The photo Fenton process (Fe-Z4A/H$_2$O$_2$/UV) was found to be the most efficient among the studied processes with the highest decolorization. The influence of experimental parameters such as pH, Fe-Z4A dose, H$_2$O$_2$ concentration, safranin concentration and tert-butyl alcohol (TBA) on the decolorization efficiency was studied. The catalytic performance of Z4A for the dye degradation was highly improved in the photo Fenton process (Fe-Z4A/H$_2$O$_2$/UV) that showed a remarkable synergetic effect with the second order kinetics. The synergic process achieved 88.34% decolorization at 0.1 g Fe-Z4A dose, 8 mM/L H$_2$O$_2$ concentration, 20 ppm safranin concentration after 120 min near wastewater pH 6. In conclusion, the photo Fenton process (Fe-Z4A/H$_2$O$_2$/UV) can be applied as an efficient and promising technique to treat the textile wastewater in real applications.