A COMPARATIVE STUDY OF ORGANIC COMPOUNDS
DEGRADATION KINETICS FROM COFFEE EFFLUENT
USING BATCH AND RECYCLE PHOTO REACTORS

L. Riadi * and L. Hwa

Department of Chemical Engineering, Faculty of Engineering, University of Surabaya
Surabaya, Indonesia
*lieke@ubaya.ac.id

ABSTRACT - Drinking water is one of the basic factors for human being, and it is increasingly becoming a limiting factor. Wastewater treatment is among the technologies to improve water quality. One of the technology that has been studied to overcome the color and organic compound removal simultaneously is photo-fenton technology. UV light can be supplied from the sun or a UV-lamp, while the chemicals needed are hydrogen peroxide and Fe(II) ion. The coffee effluent treated contained melanoidin which is not biodegradable, hence a chemical degradation using chemicals is needed to solve the problem without creating another waste. There are three steps in the photo-fenton reaction. These are the reaction between Fe ion in Fe$_2$SO$_4$.7H$_2$O with H$_2$O$_2$ in the presence of UV light. These reactions are Fenton, photolysis of H$_2$O$_2$, and photo-fenton reaction. The first reaction is a reaction of Fe$^{2+}$ with H$_2$O$_2$, which generate OH radicals and oxidize Fe$^{2+}$ to Fe$^{3+}$. The second reaction is the formation of ·OH by photolysis of hydrogen peroxide. The third reaction is a reaction of Fe$^{3+}$ with water which occurs when the light of wavelength 352 nm is irradiated, the OH radicals are generated and Fe$^{3+}$ is reduced to Fe$^{2+}$. These reactions work continuously and result ·OH radicals which will degrade melanoidin and organic compounds into CO$_2$ and H$_2$O.

Keywords: recycle photo reactor, organics compounds degradation, coffee effluent