INTISARI

PENINGKATAN EFEKTIVITAS PROSES FOTO-FENTON PADA pH 7 DALAM FOTODEGRADASI DODESIL BENZENA SULFONAT DALAM AIR LIMBAH *LAUNDRY* DENGAN CARA PENAMBAHAN ASAM SITRAT SEBAGAI PENGKELAT

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Dalam penelitian ini telah dikaji pengaruh penambahan asam sitrat sebagai senyawa pengkelat dalam proses foto-Fenton terhadap peningkatan efektivitas degradasi surfaktan anionik dalam air limbah *laundry* pada pH 7. Proses foto-Fenton dilakukan dengan cara mereaksikan air limbah *laundry* dengan pereaksi Fenton (Fe^{2+} dan H_2O_2), sinar UV, dan asam sitrat. Dalam proses foto-Fenton tersebut dipelajari pengaruh konsentrasi asam sitrat, pH, dan waktu reaksi. Penentuan konsentrasi surfaktan anionik dodesil benzena sulfonat (DBS) dilakukan dengan alat spektrofotometer UV/Visible dengan menggunakan pereaksi metilen biru. Hasil penelitian menunjukkan sampel air limbah *laundry* yang diuji mengandung surfaktan anionik DBS, sebesar 199,74 mg/L. Penambah asam sitrat ke dalam proses foto-Fenton dapat meningkatkan efektivitas degradasi DBS dalam air limbah *laundry* pada pH 7. Kondisi proses foto-Fenton terhadap 20 mL air limbah *laundry* dengan pereaksi Fe^{2+} 5 mM, H_2O_2 50 mM, asam sitrat 8 mM, pH 7, waktu radiasi 45 menit mampu menurunkan konsentrasi DBS secara maksimal hingga 99%. Hasil studi kinetika menunjukkan bahwa reaksi degradasi DBS melalui proses foto-Fenton mengikuti reaksi orde satu dengan nilai konstanta laju reaksi 0,136 $menit^{-1}$. Proses foto-Fenton dengan kondisi yang optimum dapat menurunkan konsentrasi DBS dalam air limbah *laundry* dari 232,27 mg/L menjadi 2,67 mg/L yang telah memenuhi baku mutu air limbah yaitu 5 mg/L, sehingga air limbah *laundry* tersebut dapat dibuang ke lingkungan.

Kata kunci: foto-Fenton; asam sitrat; pH netral; DBS; air limbah *laundry*

INCREASING EFFECTIVENESS OF THE PHOTO-FENTON PROCESS AT pH 7 FOR DODECYL BENZENE SULFONATE ANIONIC PHOTODEGRADATION IN LAUNDRY WASTEWATER BY THE ADDITION OF CITRIC ACID AS A CHELATING AGENT

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ABSTRACT

In this research, the effect of citric acid addition as a chelating agent in the photo-Fenton process has been studied to increase the effectiveness of anionic surfactant degradation in laundry wastewater at pH 7. The photo-Fenton process was carried out by reacting laundry wastewater with Fenton reagents (Fe^{2+} and H_2O_2), UV light, and citric acid. In the photo-Fenton process, the effect of citric acid concentration, pH, and reaction time was studied. Determination of surfactant linear dodecyl benzene sulfonate (DBS) concentration was calculated by UV/Visible spectrophotometer using methylene blue reagent. The result showed that the laundry wastewater contained DBS surfactant of 199.74 mg/L. The citric acid added to the photo-Fenton process increases the effectiveness of DBS degradation in laundry wastewater at pH 7. Photo-Fenton process conditions for 20 mL laundry wastewater with 5 mM Fe^{2+}, 50 mM H_2O_2 reagents, 8 mM of citric acid, pH solution of 7, and 45 minutes of irradiation time were able to optimally reduce DBS concentration up to 99%. The results of the kinetics study showed that the DBS degradation reaction through the photo-Fenton process followed first-order reaction with a reaction rate constant is 0.136 min^{-1}. Photo-Fenton process with optimum conditions can reduce DBS concentration in laundry wastewater from 232.27 mg/L to 2.67 mg/L which has met the wastewater quality standard of 5 mg/L, so the laundry wastewater can be disposed into the environment.

Keywords: photo-Fenton; citric acid; neutral pH; DBS; laundry wastewater