

## DEGRADASI SURFAKTAN ANIONIK DALAM AIR LIMBAH *LAUNDRY* DENGAN METODE FOTO-FENTON TERMODIFIKASI ASAM ASKORBAT SEBAGAI SENYAWA PENGKELAT

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### INTISARI

Telah dilakukan kajian proses degradasi surfaktan anionik dodesil benzena sulfonat (DBS) dalam air limbah *laundry* menggunakan metode foto-Fenton termodifikasi asam askorbat sebagai senyawa pengkelat. Penambahan asam askorbat dilakukan untuk meningkatkan efektivitas degradasi DBS dalam air limbah *laundry* pada pH mendekati netral. Proses foto-Fenton dilakukan dengan cara mereaksikan air limbah *laundry* dengan pereaksi Fenton ( $\text{Fe}^{2+}/\text{H}_2\text{O}_2$ ), sinar UV, dan asam askorbat. Dalam proses foto-Fenton tersebut dipelajari pengaruh konsentrasi asam askorbat, pH dan waktu penyinaran UV. Penentuan konsentrasi surfaktan anionik dodesil benzena sulfonat (DBS) dilakukan dengan spektrofotometer UV/Visibel menggunakan pereaksi metilen biru. Hasil penelitian menunjukkan sampel air limbah *laundry* yang diuji mengandung surfaktan anionik DBS, sebesar 154,98 mg L<sup>-1</sup>. Proses foto-Fenton dilakukan pada pH netral dengan mereaksikan 20 mL air limbah *laundry* dengan pereaksi  $\text{Fe}^{2+}$  5 mM,  $\text{H}_2\text{O}_2$  50 mM, asam askorbat 9 mM, waktu radiasi UV 60 menit, mampu menurunkan konsentrasi DBS secara maksimal hingga 98,66%. Hasil studi kinetika menunjukkan bahwa reaksi degradasi DBS melalui proses foto-Fenton termodifikasi asam askorbat mengikuti reaksi orde dua dengan nilai konstanta laju reaksi 0,0025 L mg<sup>-1</sup> menit<sup>-1</sup>. Proses foto-Fenton pada kondisi optimum dapat menurunkan konsentrasi DBS dalam air limbah *laundry* sebesar 129,74 mg L<sup>-1</sup> menjadi 1,728 mg L<sup>-1</sup> yang telah memenuhi baku mutu air limbah *laundry* yaitu 5 mg L<sup>-1</sup>, sehingga air limbah *laundry* dapat dibuang ke lingkungan.

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

*DEGRADATION OF ANIONIC SURFACTANTS IN LAUNDRY WASTEWATER BY  
THE PHOTO-FENTON METHOD MODIFIED ASCORBIC ACID AS A  
CHELATING AGENT*

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**ABSTRACT**

The degradation process of anionic surfactant dodecyl benzene sulfonate (DBS) in laundry wastewater using the photo-Fenton method modified with ascorbic acid as a chelating agent has been studied. The addition of ascorbic acid aims to increase the effectiveness of DBS degradation in laundry wastewater at a pH close to neutral. The photo-Fenton process was carried out by reacting laundry wastewater with a Fenton reagent ( $\text{Fe}^{2+}/\text{H}_2\text{O}_2$ ), UV light, and ascorbic acid. The effect of ascorbic acid concentration, pH, and UV irradiation time was studied. In the photo-Fenton process, the concentration of anionic surfactant DBS was determined by UV/Visible spectrophotometer using a methylene blue reagent. The results showed that the tested laundry wastewater samples contained  $154,98 \text{ mg L}^{-1}$  of DBS anionic surfactant. The photo-Fenton process carried out at near neutral pH by reacting 20 mL of laundry wastewater with 5 mM  $\text{Fe}^{2+}$  reagent, 50 mM  $\text{H}_2\text{O}_2$ , 9 mM ascorbic acid, 60 min irradiation time, was able to reduce the concentration of DBS maximally up to 98.66%. The results of the kinetics study showed that the reaction of DBS degradation through the ascorbic acid-modified photo-Fenton process followed a second-order reaction with a reaction rate constant value of  $0.0025 \text{ L mg}^{-1} \text{ min}^{-1}$ . The photo-Fenton process at optimum conditions can reduce the concentration of DBS in laundry wastewater from  $129,74 \text{ mg L}^{-1}$  to  $1,728 \text{ mg L}^{-1}$  which has met the laundry wastewater quality standard of  $5 \text{ mg L}^{-1}$ , so that laundry wastewater can be discharged into the environment.

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