

**PENINGKATAN EFEKTIVITAS METODE FOTO-FENTON DENGAN  
PENAMBAHAN ASAM OKSALAT DARI HATI NANAS UNTUK  
DEGRADASI DBS DALAM AIR LIMBAH *LAUNDRY***

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**INTISARI**

Dalam penelitian ini telah dikaji pengaruh penambahan asam oksalat dari hati nanas sebagai senyawa pengkkelat dalam proses foto-Fenton terhadap efektivitas degradasi DBS dalam air limbah *laundry*. Senyawa pengkkelat asam oksalat diperoleh melalui cara ekstraksi hati nanas dengan pelarut air dan konsentrasinya ditentukan dengan metode titrasi volumetri. Proses foto-Fenton dilakukan dengan cara mereaksikan air limbah *laundry* dengan pereaksi Fenton ( $\text{Fe}^{2+}$  dan  $\text{H}_2\text{O}_2$ ), sinar UV, tanpa maupun adanya asam oksalat dari hati nanas. Dalam proses foto-Fenton tersebut dipelajari pengaruh pH, konsentrasi asam oksalat, dan waktu reaksi. Penentuan konsentrasi surfaktan anionik dodesil benzena sulfonat (DBS) dilakukan dengan alat spektrofotometer UV/visibel dengan menggunakan pereaksi metilen biru. Hasil penelitian menunjukkan bahwa kadar asam oksalat dalam hati nanas sebesar 0,02% b dengan konsentrasi 2 mM. Sampel air limbah *laundry* yang diuji mengandung surfaktan anionik jenis DBS, sebesar 167,20 mg/L. Penambahan asam oksalat ke dalam metode foto-Fenton dapat meningkatkan efektivitas fotodegradasi DBS dalam air limbah *laundry* sebesar 99% pada pH 7, dibandingkan dengan tanpa adanya asam oksalat. Kenaikkan efektivitas metode foto-Fenton pada pH 7 dipengaruhi oleh konsentrasi asam oksalat dari ekstrak hati nanas, dan efektivitas yang maksimum diperoleh pada penambahan asam oksalat 1,2 mM. Waktu optimum pada degradasi DBS melalui proses foto-Fenton adalah 60 menit. Hasil studi kinetika menunjukkan bahwa reaksi degradasi DBS melalui proses foto-Fenton mengikuti reaksi orde satu dengan nilai konstanta laju reaksi 0,0734 menit<sup>-1</sup>. Proses foto-Fenton dengan kondisi yang optimum dapat menurunkan konsentrasi DBS dalam air limbah *laundry* dari 169,32 mg/L menjadi 1,14 mg/L yang telah memenuhi baku mutu air limbah yaitu 5 mg/L, sehingga air limbah *laundry* tersebut aman dibuang ke lingkungan.

**Kata kunci:** Foto-Fenton; asam oksalat dari ekstrak hati nanas; pH 7; DBS; air limbah *laundry*

***IMPROVING THE EFFECTIVENESS OF THE PHOTO-FENTON  
METHOD BY ADDING OXALIC ACID FROM PINEAPPLE HEARTS FOR  
DEGRADATION OF DBS IN LAUNDRY WASTEWATER***

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**ABSTRACT**

In this research, the effect of adding oxalic acid from pineapple hearts as a chelating compound in the photo-Fenton process on the effectiveness of degrading DBS in laundry wastewater has been studied. Oxalic acid chelating compound was obtained through pineapple heart extraction with water solvent, and its concentration was determined by volumetric titration method. The photo-Fenton process was carried out by reacting laundry wastewater with Fenton reagents ( $\text{Fe}^{2+}$  and  $\text{H}_2\text{O}_2$ ), UV light, with or without oxalic acid from pineapple hearts. In the photo-Fenton process, the effects of pH, oxalic acid concentration, and reaction time were studied. The determination of anionic surfactant dodecyl benzene sulfonate (DBS) concentration was done using a UV/visible spectrophotometer with methylene blue reagent. The results showed that the oxalic acid content in pineapple hearts was 0.02% w/w with a concentration of 2 mM. The tested laundry wastewater sample contained 167.20 mg/L of anionic surfactant DBS. The addition of oxalic acid into the photo-Fenton method could increase the effectiveness of DBS photodegradation in laundry wastewater by 99% at pH 7, compared to without oxalic acid. The increase in the effectiveness of the photo-Fenton method at pH 7 was influenced by the concentration of oxalic acid from pineapple heart extract, and the maximum effectiveness was obtained with the addition of 1.2 mM oxalic acid. The optimum time for DBS degradation through the photo-Fenton process was 60 minutes. Kinetic study results showed that the DBS degradation reaction through the photo-Fenton process followed a first-order reaction with a reaction rate constant value of  $0.0734 \text{ min}^{-1}$ . The photo-Fenton process under optimum conditions could reduce the DBS concentration in laundry wastewater from 169.32 mg/L to 1.14 mg/L, which met the wastewater quality standards of 5 mg/L, thus making the laundry wastewater safe to discharge into the environment.

**Keyword:** Photo-Fenton; oxalic acid from pineapple heart extract; pH 7; DBS;  
*laundry wastewater*