

ABSTRACT

TREATMENT OF HOTEL WASTEWATER WITH A COMBINATION OF ELECTROCOAGULATION AND ADSORPTION USING CARBOSIL

By

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This study was carried out to investigate treatment of hotel wastewater using a combination of electrocoagulation and adsorption using carbosil prepared from rice husk with pyrolysis method. Electrocoagulation was applied with the aim to remove natural organic matter in the sample, using aluminum as electrodes, with the particular purpose to study the effect of potentials. For this purpose, electrocoagulation experiments were conducted at potential of 4, 6, 8, and 10 volt at fixed contact time of 60 minutes. The treated water was then subjected to adsorption process at different contact times of 5, 10, and 15 minutes, and the performance of the process was evaluated in term of the reduction of the absorbance at maximum wavelength. The performance of the method was defined in term of absorbance reduction at the maximum wavelength of 226 nm, which was determined by scanning the original sample at the wavelength ranging from 200 to 700 nm. According to literature, the maximum wavelength of 226 nm is commonly assigned to benzene structure, most likely from the Alkyl Benzene Sulfonate (ABS) used in detergents. The results obtained indicate that for electrocoagulation process, the highest reduction in the absorbance was achieved using potential of 10 volt. Adsorption process was found to result in the diminish of peak at 226 nm, reflecting that the organic pollutant associated with this wavelegth has been completely removed from the water. According to literature, the maximum wavelength of 226 nm is commonly. Determination of BOD and COD show that the reduction of there two parameters, after electrocoagulation treatment is not significant, but significant reduction was obtained after adsorption using carbosil. The ability of carbosil adsorption was analized by SEM, XRD, and FT-IR. Characterization of the carbosil using SEM technique revealed that the carbosil has practically homogeneous surface morphology, supporting its ability to adsorb the pollutants from the wastewater. XRD characterization showed that carbosil amorphous form and FT-IR characterization shows the components of silica and carbon in carbosil and any element of C-Cl is absorbed.

Keywords: hotel wastewater, electrocoagulation, adsorption, carbosil

ABSTRAK

PENGOLAHAN LIMBAH CAIR HOTEL DENGAN KOMBINASI METODE ELEKTROKOAGULASI DAN ADSORPSI MENGGUNAKAN KARBOSIL

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Dalam penelitian ini dipelajari pengolahan limbah cair hotel dengan kombinasi metode elektrokoagulasi dan adsorpsi menggunakan karbosil yang diperoleh melalui proses pirolisis sekam padi. Percobaan elektrokoagulasi menggunakan elektroda aluminium dilakukan untuk mempelajari pengaruh potensial terhadap penurunan kadar bahan organik dengan variasi beda potensial 4, 6, 8, dan 10 volt dengan waktu 60 menit. Limbah hasil elektrokoagulasi selanjutnya dilakukan proses adsorpsi dengan waktu kontak 5, 10, and 15 menit. Hasil menunjukkan untuk panjang gelombang maksimum (λ_{max}) limbah hotel adalah 226 nm yang diperoleh melalui pemindaian sampel sebelum diolah pada panjang gelombang 200-700 nm. Berdasarkan literatur, λ_{max} 226 nm menunjukkan adanya struktur benzena diperoleh dari senyawa Alkil Benzena Sulfonat (ABS) dalam deterjen. Hasil percobaan elektrokoagulasi menunjukkan terjadi penurunan absorbansi pada λ_{max} , dimana semakin besar potensial yang digunakan menghasilkan absorbansi yang semakin kecil sehingga potensial optimum yang diperoleh adalah 10 volt. Hasil percobaan adsorpsi yaitu hilangnya puncak pada 226 nm yang menunjukkan bahwa bahan organik yang berkaitan dengan λ_{max} telah dihilangkan sepenuhnya. Hasil optimum kedua metode ini kemudian dilakukan pengukuran nilai BOD dan COD. Hasil pengukuran menunjukkan penurunan nilai BOD dan COD untuk proses elektrokoagulasi sangat sedikit, sedangkan setelah dilakukan proses adsorpsi mengalami penurunan yang signifikan. Kemampuan adsorpsi karbosil juga dilakukan analisis SEM, XRD dan FTIR karbosil sebelum dan sesudah digunakan sebagai adsorben. Analisis SEM menunjukkan bahwa karbosil yang digunakan memiliki morfologi permukaan yang homogen sebelum diasorpsi, setelah diadsorpsi permukaan terdapat flok-flok senyawa organik yang terserap. Karakterisasi menggunakan XRD menunjukkan bahwa karbosil berbentuk amorf. Karakterisasi FTIR menunjukkan adanya komponen silika dan karbon pada karbosil serta adanya unsur C-Cl yang terserap.

Kata kunci : limbah cair hotel, elektrokoagulasi, adsorpsi dan karbosil.