INTISARI

PENGARUH WAKTU IRADIASI, pH, DAN ION Cu(II) TERHADAP PENURUNAN KONSENTRASI ION Pb(II) DALAM LARUTAN DENGAN METODE FOTO–FENTON

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Logam timbal telah secara luas digunakan di berbagai kegiatan industri seperti industri cat, baterai, kabel, keramik, peleburan logam dan bahan pewarna. Konsentrasi timbal pada berbagai limbah industri dilaporkan sangat tinggi, yaitu pada limbah industri baterai sebesar 50 mg/L. Beberapa metode telah dilakukan untuk menurunkan konsentrasi Pb(II) seperti pengendapan, pertukaran ion, adsorpsi dan fotooksidasi terkatalisis. Namun metode tersebut menimbulkan polutan sekunder yang akan menjadi pencemar baru bagi lingkungan. Maka digunakanlah metode alternatif yang tidak menimbulkan polutan sekunder yaitu metode foto–Fenton. Metode ini merupakan metode AOPs (*Advanced Oxidation Processes*), yaitu metode yang didasarkan atas pembentukan radikal •OH dalam sistem larutan. Dalam penelitian ini telah dipelajari pengaruh waktu penyinaran, pH larutan, dan adanya ion Cu(II) terhadap penurunan konsentrasi ion Pb(II) dalam larutan dengan menggunakan metode foto–Fenton. Proses foto–Fenton dilakukan dengan cara menyinari campuran yang terdiri dari larutan Pb(II), H_2O_2 dan Fe^{2+} dalam reaktor tertutup yang dilengkapi dengan lampu UV yang disertai dengan pengadukan. Konsentrasi Pb(II) yang tersisa setelah proses foto–Fenton dianalisis menggunakan SSA (Spektroskopi Serapan Atom). Endapan yang dihasilkan kemudian dikarakterisasi menggunakan SEM–EDS (*Scanning Electron Microscope–Energy Dispersion X-rays Spectroscopy*).

Hasil penelitian menunjukkan bahwa proses foto–Fenton cukup efektif untuk menurunkan konsentrasi ion Pb(II) dalam larutan dengan nilai persentase sebesar 34,9%. Konsentrasi Pb(II) menurun secara efektif pada waktu penyinaran 1 hingga 50 jam. Sementara itu pada waktu penyinaran lebih dari 50 jam, konsentrasi Pb(II) cenderung tetap. Proses foto–Fenton Pb(II) dalam larutan berlangsung optimum pada pH 3. Penambahan 50 mg/L Cu(II) ke dalam proses foto–Fenton Pb(II) dapat meningkatkan keefektifan menjadi 57,5%. Proses foto–Fenton juga dapat menurunkan konsentrasi Pb(II) hingga memenuhi baku mutu yaitu sebesar 0,7 mg/L dengan melalui 4 tahapan proses.

Kata Kunci : Foto–Fenton, Pb(II), Cu(II), radikal •OH, AOPs (*Advanced Oxidation Processes*).

ABSTRACT

THE EFFECT OF IRRADIATON TIME, pH SOLUTIONS, AND Cu(II) IONS ON THE LOWERING CONCENTRATION OF Pb(II) IN THE SOLUTIONS BY PHOTO–FENTON METHOD

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Lead is widely used in various industrial activities such as paints, batteries, cables, ceramics, metal smelting, and dyes. The concentration of lead in various industrial waste is reported to be very high, as in battery industry waste of 50 mg/L. Several methods have been carried out to lower Pb(II) concentration such as precipitation, ion exchange, adsorption, and catalyzed photooxidation. However, these methods generate secondary pollutants which become new contaminants to the environment. Then an alternative method which doesn't cause secondary pollutants is used, it is the photo–Fenton method. This method is an AOPs (*Advanced Oxidation Processes*) method, which is a method based on the formation of •OH radicals in the solution system. The effect of irradiation time, pH, and Cu(II) ions on the lowering concentration of Pb(II) on the solutions by photo–Fenton method has been studied. Photo–Fenton process was carried out by irradiating a mixture of Pb(II) solutions, H_2O_2, and Fe^{2+} in a closed reactor equipped with UV lamp and accompanied by stirring. Pb(II) concentration left in the solution after the photo–Fenton process was analyzed by using AAS (*Atomic Adsorption Spectroscopy*). The formed precipitation was then characterized by using SEM–EDS (*Scanning Electron Microscope–Energy Dispersion X-rays Spectroscopy*).

The results showed that photo–Fenton process was quite effective to decrease the concentration of Pb(II) by 34.9%. The concentration of Pb(II) could decrease effectively at irradiation time of 1 to 50 hours. Meanwhile for the longer time than 50 hours, the concentration of Pb (II) tended to remain constant. The process of photo–Fenton Pb(II) in the solution was held optimally at pH 3. Adding 50 mg/L of Cu(II) in the photo–Fenton process of Pb(II) could increase the effectiveness to 57.5%. The photo-Fenton process also could decrease the concentration of Pb(II) to fulfill the standard quality value regulated by government. It was obtained after 4 steps of photo–Fenton processes where it gave final concentration Pb(II) of 0.7 mg/L.

Keywords : Photo–Fenton, Pb(II), Cu(II), •OH radicals, AOPs (*Advanced Oxidation Processes*)