

Aplikasi Elektrolisis Plasma untuk Pengolahan Limbah Cair Fenol dan Logam Cr(VI) dengan Aditif Metanol = Plasma Electrolysis Application for Phenol and Cr(VI) Liquid Waste Treatment with Methanol Additive

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Abstrak

Limbah cair fenol dan Cr(VI) merupakan senyawa organik serta logam berat yang berbahaya dan banyak terkandung dalam limbah cair yang dihasilkan oleh industri seperti industri cat dan tekstil. Teknologi konvensional masih kurang efektif dalam mengolah kedua jenis limbah tersebut, sehingga diperlukan metode degradasi limbah yang tepat. Melalui penelitian ini, limbah cair fenol dan Cr(VI) didegradasi secara simultan menggunakan teknologi elektrolisis plasma dengan aditif metanol yang menghasilkan spesi reaktif $\bullet\text{OH}$ dan $\text{H}\bullet$. Kedua spesi reaktif ini mampu mendegradasi limbah organik dan anorganik secara simultan. Penelitian dilakukan pada kondisi tegangan 650 V pada anoda dan 400 V pada katoda melalui hasil karakterisasi arus dan tegangan. Kondisi optimum didapatkan setelah melakukan uji degradasi dengan variasi posisi pembentukan plasma, konsentrasi aditif metanol, konsentrasi awal limbah Cr(VI), dan laju injeksi udara yaitu plasma anodik, konsentrasi metanol 0,1%v, konsentrasi awal limbah Cr(VI) 100 ppm, dan laju injeksi udara 0,2 L/min. Dari kondisi optimum tersebut, menghasilkan persentase degradasi fenol 96,36% dan Cr(VI) 78% pada akhir menit ke-90, produksi radikal OH mencapai 3,6 mmol serta kandungan COD yaitu sebesar 1295,35 ppm pada akhir menit ke-120.

.....Phenol and Cr(VI) liquid waste are dangerous organic and heavy metal compounds that are widely contained in the wastewater produced by industries, such as paint and textile industries. Conventional technology is still ineffective in treating the two types of waste, so it requires an appropriate waste degradation method. Through this research, phenol and Cr (VI) wastewater was degraded simultaneously using plasma electrolysis technology with methanol additive which produced reactive species $\bullet\text{OH}$ and $\text{H}\bullet$. Both reactive species are able to degrade organic and inorganic waste simultaneously. The research was conducted at voltage conditions of 650 V at the anode and 400 V at the cathode through the results of current and voltage characterization. The optimum conditions were obtained after conducting the degradation test with variations in the position of plasma formation, the concentration of methanol additives, the initial concentration of Cr(VI) waste, and the rate of air injection, which are anodic plasma, 0.1%v methanol concentration, 100 ppm initial concentration of Cr(VI) waste, and an air injection rate of 0.2 L/min. From these optimum conditions, the percentage of phenol degradation was 96.36% and Cr(VI) 78% at the end of the 90th minute, the production of OH radicals reached 3.6 mmol, and the COD content of 1295.35 ppm at the end of the 120th minute.