Studi Efektivitas Elektroda Stainless Steel-201 Pada Proses Degradasi Limbah Remazol Red Dengan Metode Elektrolisis Plasma Anodik = Effectiveness Study of Stainless Steel-201 Electrodes in Remazol Red Waste Degradation Process Using Anodic Plasma Electrolysis Method

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Abstrak

Elektrolisis plasma merupakan salah satu metode AOP (Advanced Oxidation Process) yang dapat menghasilkan radikal hidroksil (OH•) dan radikal hidrogen (H•) dalam jumlah lebih banyak. Penelitian ini bertujuan untuk mengetahui efektivitas elektroda stainless steel pada zona plasma anodik serta pengaruh laju injeksi udara dan daya terhadap degradasi Remazol Red dan erosi anoda. Penelitian dilakukan dengan reaktor 1,2 L menggunakan variasi laju injeksi udara 0,6 lpm, 0,8 lpm, 1 lpm, 1,2 lpm, dan 1,5 lpm serta variasi daya 400 W, 500 W, dan 600 W dengan elektrolit K₂SO₄ 0,02 M. Pada penelitian ini, didapat hasil degradasi yang lebih baik oleh elektroda stainless steel dibandingkan tungsten. Dalam waktu 8 menit, stainless steel mampu mendegradasi sebanyak 94,73% sedangkan tungsten hanya mampu sebesar 84,54% dan ditinjau dari erosinya stainless steel hanya tergerus sebanyak 0,07 gr, sedangkan tungsten sebanyak 1,8 gr. Laju injeksi udara yang menghasilkan tingkat degradasi optimum adalah 1,2 Lpm dan variasi daya yang optimum untuk laju injeksi tersebut adalah 500 W. Persentase degradasi optimum Remazol Red mencapai 99,84%, sementara degradasi Pt-Co sebesar 99,16%, dan COD sebesar 84,16% pada konsentrasi awal limbah 200 ppm dan FeSO₄ 20 ppm. Produk samping yang didapat berupa amonia sebesar 0,438 mmol dan nitrat sebesar 1,736 mmol.

.....Plasma electrolysis is an AOP (Advanced Oxidation Process) method that can produce more hydroxyl radicals (OH•) and hydrogen radicals (H•). This study aims to determine the effectiveness of stainless steel electrodes in the anodic plasma zone and the effect of air and power injection rates on the degradation of Remazol Red and anode erosion. The research was conducted with a 1.2 L reactor using air injection rate variations of 0.6 lpm, 0.8 lpm, 1 lpm, 1.2 lpm and 1.5 lpm and power variations of 400 W, 500 W and 600 W with electrolyte K₂SO₄ 0.02 M. In this study, better degradation results were obtained by stainless steel electrodes than tungsten. Within 8 minutes, stainless steel was able to degrade as much as 94.73%, while tungsten was only able to 84.54% and in terms of its erosion, stainless steel only eroded as much as 0.07 gr, while tungsten as much as 1.8 gr. The air injection rate that produces the optimum degradation rate is 1.2 Lpm and the optimum power variation for the injection rate is 500 W. The optimum degradation percentage of Remazol Red reaches 99.84%, while the degradation of Pt-Co is 99.16%, and COD of 84.16% at the initial waste concentration of 200 ppm and 20 ppm FeSO₄. The by-products obtained were 0.438 mmol of ammonia and 1.736 mmol of nitrate.