

# Degradasi Limbah Pewarna Tekstil Remazol Brilliant Blue dan Sintesis Pupuk Nitrat Cair secara Simultan pada Tegangan Tinggi dengan Teknologi Air Injection Plasma Electrolysis = Degradation of Remazol Brilliant Blue Textile Dye Waste and Simultaneous Synthesis of Liquid Nitrate Fertilizer at a High Voltage with Air Injection Plasma Electrolysis Technology

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## Abstrak

Teknologi elektrolisis plasma sudah banyak dibuktikan efektif mendegradasi limbah pewarna tekstil karena kemampuannya menghasilkan radikal hidroksil dalam jumlah yang besar dan menghasilkan pupuk nitrat cair dengan memanfaatkan gas nitrogen dan oksigen yang diinjeksikan dari udara. Penelitian ini bertujuan menguji kemampuan metode elektrolisis plasma dalam mendegradasi limbah salah satu pewarna tekstil, yaitu *Remazol Brilliant Blue* sekaligus secara simultan mensintesis pupuk nitrat cair pada tegangan tinggi. Penelitian dilakukan dengan membangkitkan plasma dengan katoda stainless steel dan anoda tungsten yang tercelup sedalam 2 cm di larutan  $K_2SO_4$  serta pewarna *remazol brilliant blue* dalam reaktor sirkulasi internal dengan volume 1,2 L. Metode ini dilakukan pada reaktor batch menggunakan variasi konsentrasi limbah 100 ppm, 200 ppm, 300 ppm, tegangan 800 V, 900 V, 1000 V, 1100 V, suhu 50 °C, 60 °C, 70 °C, serta diameter elektroda 1 mm; 1,6 mm; dan 2,4 mm. Hasil optimum baik dari segi degradasi maupun konsentrasi nitrat terbentuk didapatkan pada tegangan 1100 V, suhu 60 °C, diameter elektroda 2,4 mm dan konsentrasi limbah 100 ppm. Uji COD menunjukkan nilai sebesar 16,65 mg/L dan dampak persentase ketergerusan tertinggi disebabkan oleh penurunan diameter elektroda.

.....Plasma Electrolysis Technology has been proven to be effective on textile dye waste degradation due to its ability to produce large amounts of hydroxyl radicals. and producing liquid nitrate fertilizer by utilizing nitrogen gas and oxygen injected from the air. This research aims to test the ability of plasma electrolysis methods to degrade the waste of one textile dye, namely *Remazol Brilliant Blue*, and the simultaneous synthesis of nitrate liquid fertilizer at a high voltage. The study was conducted by generating plasma with stainless steel cathodes and tungsten anodes dyed as deep as 2 cm in electrolyte solutions of  $K_2SO_4$  and remazol brilliant blue dye in internal circulation reactors with a 1,2 L volume. This method is carried out on batch reactors using variations in waste concentrations of 100 ppm, 200 ppm, 300 ppm, voltage of 800 V, 900 V, 1000 V, and 1100 V, temperature of 50 °C, 60 °C, and 70 °C, and also electrode diameter variations of 1 mm; 1.6 mm; and 2.4 mm. The optimum results on the degradation and nitrate production side are 1100 V of voltage, 60 °C of temperature, 2.4 mm of electrode diameter and 100 ppm of waste concentrations. The COD test showed a value of 16.65 mg/L and the highest effect of electrode's erosion percentages is caused by electrode diameter reduction.