Sintesis Pupuk Nitrat dari Degradasi Limbah Pewarna Tekstil Remazol Brilliant Blue dengan Metode Air Plasma Electrolysis = Synthesis of Nitrate Fertilizer from Degradation of Remazol Brilliant Blue Textile Dye Waste by Air Plasma Electrolysis

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Abstrak

Metode Air Plasma Electrolysis sudah banyak dibuktikan efektif mendegradasi limbah pewarna tekstil karena kemampuannya menghasilkan radikal hidroksil dalam jumlah yang besar dan menghasilkan pupuk nitrat 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 dan sintesis pupuk nitrat secara simultan. Penelitian dilakukan dengan membangkitkan plasma dengan katoda stainless steel dan anoda tungsten di larutan K2SO4 dan K2HPO4 serta pewarna remazol brilliant blue dalam reaktor sirkulasi internal dengan volume 1,2 L. Metode ini dilakukan pada reaktor batch menggunakan variasi konsentrasi limbah 50 ppm, 100 ppm, 150 ppm, 200 ppm, kombinasi elektrolit K2HPO4 dan K2SO4 dengan variasi konsentrasi 0,01 M; 0,02 M, daya 400 W, 500 W, 600 W, laju alir udara 0,2 lpm, 0,4 lpm, 0,6 lpm, 0,7 lpm, 0,8 lpm, 0,9 lpm, 1 lpm, serta variasi penambahan ion Fe2+ 10 ppm, 20 ppm, dan 30 ppm. Hasil optimum pada sisi degradasi didapatkan pada 0,2 M K2SO4, daya 500 W, laju alir udara 0,7 L/min, ion Fe2+ 20 ppm, serta konsentrasi awal limbah 50 ppm dan dari sisi produksi nitrat adalah 0,01 M K2SO4 dan 0,01 M K2HPO4, daya 600 W, laju alir udara 0,9 L/min, ion Fe2+ 20 ppm, serta konsentrasi awal limbah 50 ppm. Uji COD menunjukkan nilai sebesar 16,65 mg/L dan senyawa intermediet berupa nitrogen organik. Pemberian pupuk cair nitrat dengan metode APE ini terhadap 5 tanaman yaitu cabai, tomat, kacang panjang, timun, serta sawi hijau menunjukkan hasil yang lebih baik dari sisi tinggi tanaman, jumlah daun, panjang daun, dan berat basah tanaman dibandingkan tanpa pupuk maupun dengan pupuk komersial

.....Air Plasma Electrolysis Method has been widely proven effective in degrading textile dye waste because of its ability to produce large amounts of hydroxyl radicals and produce nitrate fertilizer by utilizing nitrogen and oxygen gases injected from the air. This study aims to test the ability of the plasma electrolysis method in degrading the waste of one of the textile dyes, namely Remazol Brilliant Blue, and the simultaneous synthesis of nitrate fertilizer. The study was conducted by generating plasma with a stainless-steel cathode and tungsten anode in a solution of K2SO4 and K2HPO4 as well as Remazol Brilliant Blue dye in an internal circulation reactor with a volume of 1.2 L. This method was carried out on batch reactors using a variety of waste concentrations of 50 ppm, 100 ppm, 150 ppm, 200 ppm, a combination of electrolytes K2HPO4 and K2SO4 with a concentration variation of 0.01 M; 0.02 M, power 400 W, 500 W, 6 00 W, air flow rate of 0.2 lpm, 0.4 lpm, 0.6 lpm, 0.7 lpm, 0.8 lpm, 0.9 lpm, 1 lpm, as well as variations in the addition of Fe ions2 + 10 ppm, 20 ppm, and 30 ppm. The optimum results on the degradation side were obtained at 0.2 M K2SO4, power 500 W, air flow rate 0.7 L / min, Fe2+ ions 20 ppm, as well as the initial concentration of waste 50 ppm, and from the nitrate production side is 0.01 M K2SO4 and 0.01 M K2HPO4, power 600 W, air flow rate 0.9 L / min, Fe2+ ions 20 ppm, as well as the initial concentration of waste 50 ppm. The COD test showed a value of 16.65 mg / L and intermediate compounds in the form of organic

nitrogen. The application of liquid nitrate fertilizer with the APE method to 5 plants, namely chili, tomatoes, long beans, cucumber, and mustard greens, showed better results in terms of plant height, number of leaves, leaf length, and wet weight of plants compared to without fertilizer or commercial fertilizers