Produksi gas hidrogen melalui proses elektrolisis larutan NaCl menggunakan variasi elektroda berbasis material karbon dan stainless steel = Hydrogen gas production through electrolysis process of NaCl solution using electrode variation based on carbon and stainless steel material

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Abstrak

Hidrogen merupakan suatu sumber energi alternatif ramah lingkungan yang memiliki potensi sangat besar untuk dikembangkan. Gas hidrogen dapat dihasilkan secara sederhana dengan metode elektrolisis. Pada penelitian ini menggunakan metode elektrolisis NaCl. Proses elektrolisis berlangsung selama 10 menit untuk setiap variasi tegangan listrik. Adapun variabel NaCl nya yaitu NaCl 0,5; 1; 1,5; 2; 2,5; dan 3 M, tegangan listrik 5, 8, 11, 14, 17, dan 20 V, dan variasi elektroda yang meliputi variasi 1 berbentuk potongan - potongan Stainless Steel 316, variasi 2 berbentuk batang Stainless Steel 316 bercabang tiga, dan variasi 3 berbentuk potongan - potongan Stainless Steel 316 – karbon aktif granular. Berdasarkan penelitian yang telah dilakukan membuktikan bahwa semakin tinggi konsentrasi NaCl dan tegangan listrik, maka semakin besar nilai kuat arus listrik, daya listrik, laju produksi gas hidrogen, nilai hambatan listriknya semakin kecil, dan nilai pH larutan elektrolitnya semakin besar yang menunjukkan adanya NaOH sebagai produk samping. Peningkatan daya listrik menyebabkan efisiensi energi sel elektrolisis menurun. Variasi elektroda terbaik yaitu variasi elektroda 2 yang berbentuk batang Stainless Steel 316 bercabang tiga dengan nilai hambatan listrik paling kecil sebesar 5,4216 dan total laju produksi gas hidrogen yang dihasilkan paling besar sebesar 1,328 mL/s dengan yield sebesar 50% pada konsentrasi NaCl 2,5 M, serta menghasilkan nilai efisiensi energi sebesar 39%; 24%; 18%; 14%; 11% dan 10% pada masing – masing variasi tegangan listrik 5, 8, 11, 14, 17, dan 20 V, dengan tingkat kemurnian gas hidrogennya sebesar 97,54%.
.....Hydrogen is an environmentally friendly alternative energy source that has enormous potential to be developed. Hydrogen gas can be produced simply by electrolysis method. In this research using the NaCl electrolysis method. The electrolysis process lasts for 10 minutes for each variation of the electric voltage. The NaCl variable are 0,5; 1; 1,5; 2; 2,5; and 3 M, the electric voltage variables are 5, 8, 11, 14, 17, and 20 V, and variations of the electrodes which include variation 1 in the form of 316 Stainless Steel pieces, variation 2 in the form of three-pronged 316 Stainless Steel rods, and variation 3 in the form of Stainless Steel 316 pieces – granular activated carbon. Based on the research that has been done, it proves that the higher the concentration of NaCl and the electric voltage, the greater the value of the electric current strength, electric power, the rate of production of hydrogen gas, the smaller the value of the electrical resistance, and the greater the pH value of the electrolyte solution which indicates the presence of NaOH as a side product. The increase in electric power causes the energy efficiency of the electrolytic cell to decrease. The best electrode variation is the variation of electrode 2 which is in the form of a three-pronged Stainless Steel 316 rod with the smallest electrical resistance value of 5,4216 and the highest total production rate of hydrogen gas produced is 1,328 mL/s with a yield of 50% at 2,5 M NaCl concentration, and produces an energy efficiency value of 39%; 24%; 18%; 14%; 11% and 10% for each variation of electric voltage 5, 8, 11, 14, 17, and 20 V, with a purity level of hydrogen gas of 97,54%.