过程与工艺

Experimental Study of Plasma Under-liquid Electrolysis in Hydrogen Generation

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摘要 The application and characteristics of relatively big volume plasma produced with cathodic glow discharges taking place across a gaseous envelope over the cathode which was dipped into electrolyte in hydrogen generation were studied. A critical investigation of the influence of methanol concentration and voltage across the circuit on the composition and power consumption per cubic meter of cathode liberating gas was carried out. The course of plasma under-liquid electrolysis has the typical characteristics of glow discharge electrolysis. The cathode liberating gas was in substantial excess of the Faraday law value. When the voltage across the circuit was equal to 550 V, the volume of cathodic gas with sodium carbonate solution was equal to 16.97 times the Faraday law value. The study showed that methanol molecules are more active than water molecules. The methanol molecules were decomposed at the plasma-catholyte interface by the radicals coming out the plasma mantle. Energy consumption per cubic meter of cathodic gases (WV) decreased while methanol concentration of the electrolytes increased. When methanol concentration equaled 5% (j), WV was 10.381′103 kJ/m3, less than the corresponding theoretic value of conventional water electrolysis method. The cathodic liberating gas was a mixture of hydrogen, carbon dioxide and carbon monoxide with over 95% hydrogen, if methanol concentration was more than 15% (j). The present research work revealed an innovative application of glow discharge and a new highly efficient hydrogen generation method, which depleted less resource and energy than normal electrolysis and is environmentally friendly.

关键词 hydrogen generation,plasma,glow discharge electrolysis,methanol

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