Exhibit 22

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AN EXPERIMENTAL STUDY ON THE EFFECT OF ELECTROLYTIC CONCENTRATION ON THE RATE OF HYDROGEN PRODUCTION

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The effects of concentration of electrolytes on hydrogen production rate (HPR) at different applied voltages were experimentally evaluated in this research paper. The rate of hydrogen production was found to be directly proportional to the concentration of total dissolved solids and the efficiency did not change much with the change in the concentration of solids. Sensitivity analysis of the electrolysis system was also carried out to understand the relative importance of concentration of total dissolved solids (TDS) on the HPR, which can help for an optimum design.

Keywords: ***Electrolysis; Efficiency; Hydrogen production rate (HPR); Total dissolved solids (TDS); Sensitivity analysis***

INTRODUCTION

Hydrogen is considered as potential alternative energy carrier and has all the desirable qualities to replace the fossil fuels. Hydrogen energy can be stored until it is needed and transported to where it is required. It does not occur naturally in large quantities on earth. It has to be separated from other compounds such as water or fossil fuels. Current technologies used for producing the hydrogen are steam methane reforming (SMR), coal gasification, biomass gasification and electrolysis (Nath, 2003; Kothari, 2004).

The production of hydrogen by the electrolysis of water is, in principle, very simple. Electrolysis works by passing direct current (DC) through an electrolyte. Tap water, a simple electrolyte, is slightly conductive because it contains a certain amount of minerals,

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$$H_2O \rightarrow H_2 + \frac{1}{2}O_2 \quad (1)$$

$$2H^+ + 2e^- \rightarrow H_2 \quad (2)$$

$$2H^+(aq) + 2e^- \rightarrow H_2$$

$$2H_2O(1) \rightarrow O_2(g) + 4H^+(aq) + 4e^-$$

$$H_2O \rightarrow H_2 + \frac{1}{2}O_2$$

$$4H^+ + 4e^- \rightarrow 2H_2$$

$$4OH^- \rightarrow O_2 + 2H_2O + 4e^-$$

$$2\,H_2O \rightarrow 2\,H_2 + O_2$$

$$R = L/(kA)$$

$$\Lambda = kVe = k(E/\rho)$$

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