

Hydrogen by Chemically Splitting Water using Electropositive Metals

The reaction between metals and water with evolution of hydrogen will be studied. In our previous research, seven metals have been tested and these are as follows: Calcium (Ca), Magnesium (Mg), Aluminum (Al), Iron (Fe), Zinc (Zn), Copper (Cu) and Strontium (Sr). Experimental results have shown that the pH value of solution and the system temperature greatly affect the overall conversion and reaction kinetics. Sr prefers neutral and weak alkaline conditions. Under weak acid condition, Mg and Ca can achieve higher conversion and kinetics. High pH values improve Al performance greatly. Fe, Zn and Cu can react with water under room temperature at very low pH values; however the reaction time is too long. Increasing temperature greatly increases reaction rate due to the Arrhenius effect.

Costs of producing the same amount of energy using metals and water has also been compared. Strontium (Sr) is good reactant but too expensive to use; the cost using Al, Mg and Ca are feasible when compared to coal, oil and natural gas. The major goal of this work will be to improve the rates of the reactions between water and the metals.

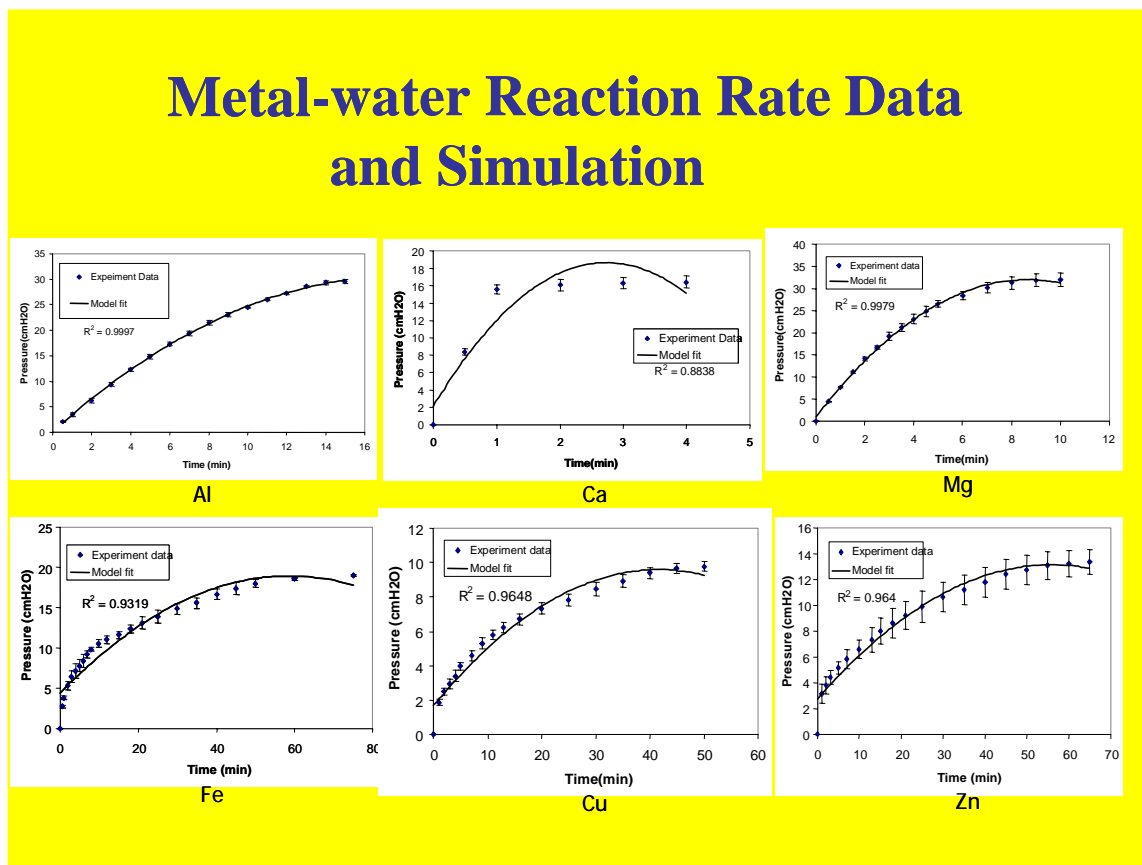


Fig. 12. Metal-water reaction rate data.