

Public Abstract

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Department:Chemical Engineering

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Title:THE KINETICS OF NON-CATALYZED SUPERCRITICAL WATER REFORMING OF ETHANOL

Ethanol, a renewable fuel produced from crops grown in Missouri such as corn, may be converted into hydrogen by a unique process that utilizes supercritical water. Supercritical water is high pressure, high temperature water, that acts both like steam and like liquid water at the same time. Supercritical water can easily mix and react with ethanol to produce hydrogen and unlike common means of producing hydrogen from ethanol, supercritical water does not require catalysts, which are expensive and easily damaged. As a result supercritical water can reform ethanol into hydrogen using a reactor about half the size of a 2-liter soft-drink bottle.

Since supercritical water reforming of ethanol to hydrogen does not use catalysts and has a small reactor volume, it can be used to build small, portable electrical generators for use in emergency situations, remote areas, and by the military. Since it does not use neat or distilled ethanol, supercritical water can reform ethanol after the fermentation step of production, prior to the expensive and energy intensive step of distillation to purify ethanol. Thus hydrogen can be produced from ethanol in mostly water, at about the same concentration as beer and wine. This work has studied the feasibility of producing hydrogen from ethanol using supercritical water and has determined, in part, how the chemical reactions occur, which will allow for future optimization and construction of supercritical water reformers for power generation.