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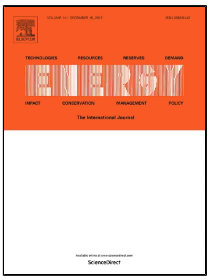

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Deuterium Isotope Separation by Combined Electrolysis Fuel Cell

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Abstract

The framework about combined electrolysis fuel cell (CEFC) was reported previously [H. Matsushima et al., *Energy*, 2005; 30; 2413]. The purpose of the present study focused on measuring the separation factor and the energy reduction by assembling CEFC system. The separation of deuterium was studied with a 1-M KOH electrolyte containing 10 at% deuterium. Polarization plots of alkaline water electrolysis (AWE) revealed relationships between the catalytic activity of the hydrogen evolution reaction and the deuterium separation factor. The power loss was mainly attributed to gas bubble evolution. For polymer electrolyte fuel cells (PEFCs) with a Pt catalyst, approximately 21% of the electrical energy could be recovered by reusing hydrogen gas produced by the AWE. Furthermore, the PEFC could efficiently dilute protium in the gas phase, resulting in a high separation factor of 30.2 for the CEFC.

Keywords: Void fraction; Electrolysis; Energy Efficiency; Fuel Cell