

Title:**Hydrogen Generation and Storage System Using Sodium Borohydride at High Pressures for Operation of a 100 W-Scale PMFC Stack****Authors & affiliations:**

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Abstract:

A study is reported on the generation and storage of hydrogen from sodium borohydride (NaBH₄) solutions in batch reactors, under pressures up to 4 MPa, in the presence of an improved and reused non-noble nickel-based powered catalyst. It follows references [1-10].

The first two purposes of the present work were to study the influence of the *solution medium* in the volume of hydrogen generated by hydrolysis of NaBH₄, with a specific interest in:

- (1) comparing the performance of water and viscous-elastic solutions, particularly with poly-acrylic-acid (PAA) and carboxyl-methyl-cellulose (CMC) in water;
- (2) analysing both the influence of the hydrogen pressure and of the *solution medium* on the hydrogen solubility during reaction, leading to its storage in the liquid phase inside the reactor.

Experimental tests were performed, with and without stirring, under controlled and uncontrolled reaction temperature. The temperature of the reactor medium and the hydrogen evolution were monitored and recorded simultaneously with a data acquisition system using Labview software. To monitor the rate of hydrogen generation, the gas pressure inside the reactor was followed with an appropriate pressure probe.

A third goal of the work was to accurately measure the solubility of molecular hydrogen in the liquid phase inside the reactor, after successive loadings of reactant solution. As it is well known, when the pressure of the gas increases so does the hydrogen dissolution in the liquid phase. The cumulative volume of hydrogen generated fed a polymer electrolyte fuel cell stack used in a 100 W-scale integrated mobile application.

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