

## Hydrogen Production using Unitized Regenerative Fuel Cell

Amit Chandrakant Bhosale, Debanand Singdeo, Dr. Prakash Chandra Ghosh

Department of Energy Science and Engineering,

IIT Bombay, (India)- 400076

Unitized regenerative fuel cell (URFC) along with PV system, finds application as a standalone system to power the load because of its ability to produce the hydrogen (electrolyser mode) and use the same in fuel cell, thus reducing its dependence on availability of fueling gases and batteries. Thus, a URFC of effective area  $2 \times 2 \text{ cm}^2$  is fabricated and tested for electrolyser mode and fuel cell mode. Bipolar plate of graphite with serpentine flow field is used to circulate saturated steam and fueling gases in electrolyser and fuel cell modes respectively. Theoretical current output in case of fuel cell is calculated to be 4 A with 120 mL/min flow rate of hydrogen input to the cell and theoretical steam supplied to electrolyser for 30 mL/min of hydrogen gas output is 85 mL/min at 1 bar. The experiment is done on URFC to find out the actual outputs in fuel cell mode and electrolyser mode as well. Hydrogen is found to be producing approximately at the rate of 10 mL/min on the application of current of 3.2 Amp at 1.8 V in electrolyser mode whereas, current of 2.9 Amp at 0.7 V is found in fuel cell mode. The performance is investigated for gas leaks and inefficient design of the flow field for steam distribution over the electrode surface.