Future Direction and Challenges in Fuel Cell Science and Technology

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Future development and implementation of fuel cell technology would depend on upward trend in global oil price, depletion of oil well, fall in oil well discovery and the improvement in hydrogen energy infrastructure. The concern for green house gas emission by automobile, thermal power plant, petroleum-crude refinery would catalyse the development and implementation of hydrogen energy and fuel cell unless financial benefit is perceived by users and the manufacturers. Although scale of economy does not work out at present for PEMFC (Proton Exchange Membrane Fuel Cell) based automobile or SOFC (Solid Oxide Fuel cell) based stationary power plant with inadequate hydrogen infrastructure but it is hoped that with the increase in crude price, no new crude or gas reserves, stack efficiency increase, decrease in fuel cell cost and improvement in hydrogen energy infrastructure, the fuel cell vehicle and distributed power generation using fuel cell will become more profitable leaving aside the cost benefits due to less environmental pollution. In this paper an elaborate study on choice of fuel cell, fuel and its application is discussed followed by technology and cost targets for PEMFC, SOFC and DAFC (Direct Alcohol Fuel Cell). A brief FC development work under taken by the author at IIT Delhi will be presented. Finally the scope of further work in the area of fuel cell is discussed to meet the cost and technology targets.

Key words: Fuel Cell (FC) Technology, Crude Price, Hydrogen Energy Infrastructure, Future Challenges in FC technology

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