

NOVEL ELECTROLYTE-LAYER FREE FUEL CELL TECHNOLOGY AS AN ALTERNATIVE OF CONVENTIONAL FUEL CELL TECHNOLOGY

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Energy has been one of the top challenges to the world for several decades. Energy technologies producing pollution cause global warming and have forced the policy makers to focus on alternate energy technologies which can be environment friendly. Considering several renewable energy conversion technologies, fuel cell is one of the most efficient technologies to supply green energy for stationary and automotive applications. Among many fuel cell families, solid oxide fuel cell (SOFC) is very attractive because of its potential advantages including fuel flexibility and use of non-noble metals for electrode reactions. However, conventional SOFC with high operating temperatures (750-1000 °C) faces problems of materials degradation, materials selection and result in high operational and capital costs. In such a situation, lowering of SOFC operational temperature has been a main objective for last two decades. To reach this goal, materials having sufficient ionic conductivity and corresponding electrodes catalytic activities at low temperatures are required. Currently, three in one based electrolyte-layer free fuel cell (EFFC) technology has been investigated as an alternative of conventional fuel cell. Three in one is a mixture of semiconductor and ionic materials with specific combinations which can induce ion conducting properties and changes in band structure resulting in fast charge transfer and redox processes for electrochemical catalyst functions. EFFC devices have demonstrated 500-1000 mW/cm² results below 600 °C. Upper hand of new technology is that it is easy to fabricate and handle during device operation. This invention has made promising applications for new generation fuel and solar energy conversions.

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