

Greenhouse Gas Inventory and Climate Change Research at CSIR, India

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Abstract

In alignment with the climate change policies and commitments of the Government of India, Climate Change and Data Science (CCDS) has emerged as a significant focus area within CSIR. Given the criticality of climate change on a global scale, it is essential to harness the power of data science in understanding, monitoring and addressing its complexities to mitigate detrimental effects to environment and mankind. The primary mandate of the CCDS area is to independently validate the net greenhouse gas (GHG) impact and, where applicable, assess the overall environmental impact (excluding GHGs) of all CSIR-IIP technologies across divisions, both in existence and under development. CCDS is leveraging the Data Science tool for research in hydrogen storage, where Machine Learning (ML) is successfully employed to screen TiZrNbMoV and TiVZrHfNb as potential hydrogen storage material with capacity >2.5 weight percent. The developed HEA alloy can be connected to fuel cell ranging from 500 W to 10 kW to generate power. In another activity ML is used for the development of environment friendly, non-flammable solid-state battery for EV having high heat resistance, high energy capacity, high durability and fast charging. CCDS area using Life Cycle Assessment (LCA) of different in-house as well as emerging technologies for their net greenhouse gas (GHG) and associated environmental impact analysis.

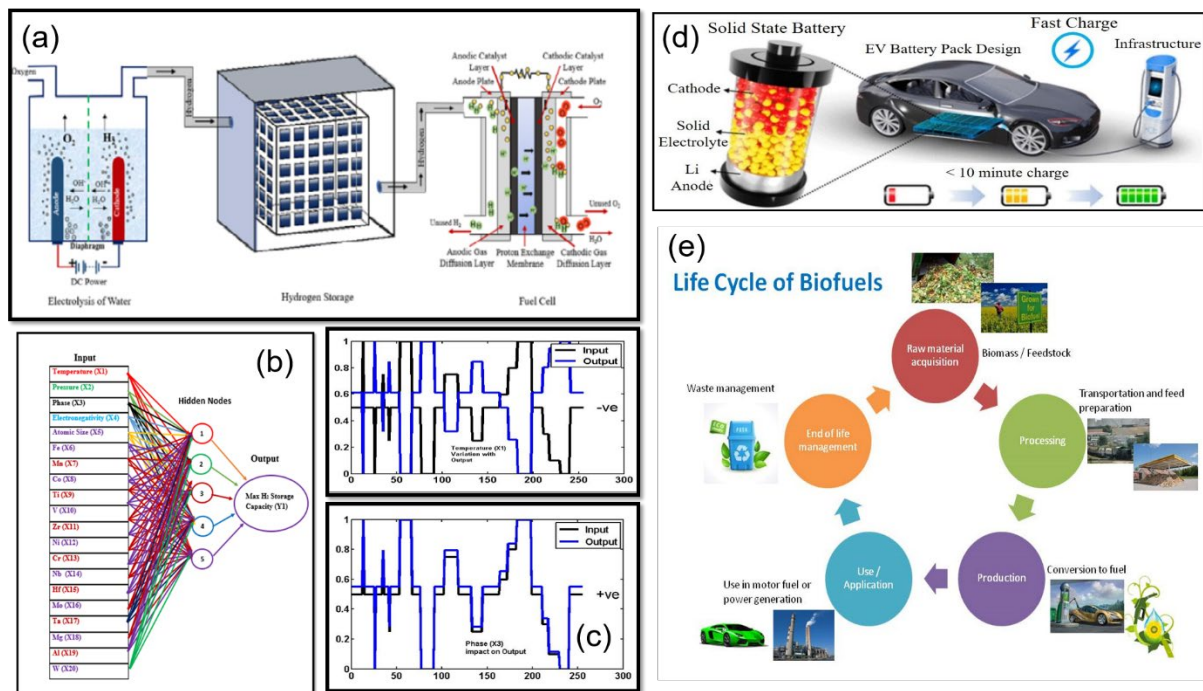


Figure 1: (a) Scheme showing the H₂ production, storage and utilization, (b) ML model input and output mapping for HEA as H₂ storage material, (c) Single Variable Response of Temperature and Phase on H₂ storage; (d) Scheme showing usage of solid state battery for EV; (e) Scheme for Life Cycle Assessment (LCA) of Biofuels