Decarbonized Energy and Process Systems Engineering

AZIZ Lab

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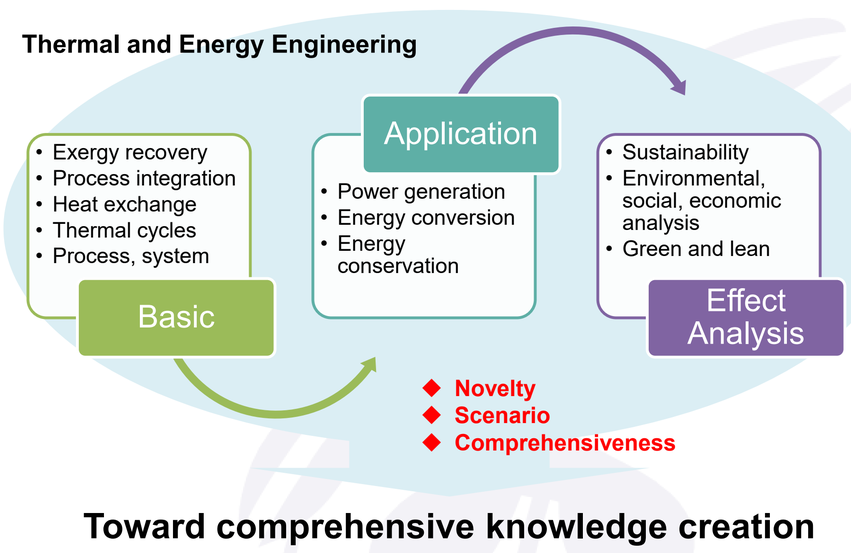
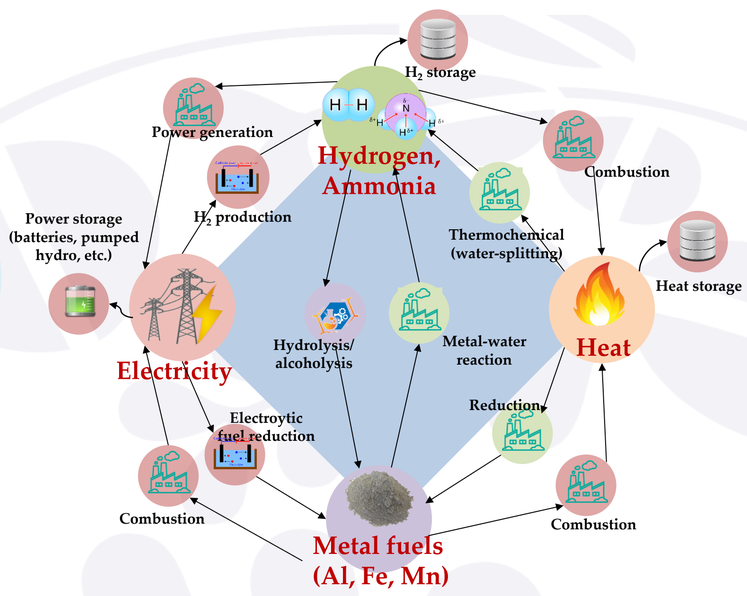
Advanced adoption of clean secondary energy toward sustainability

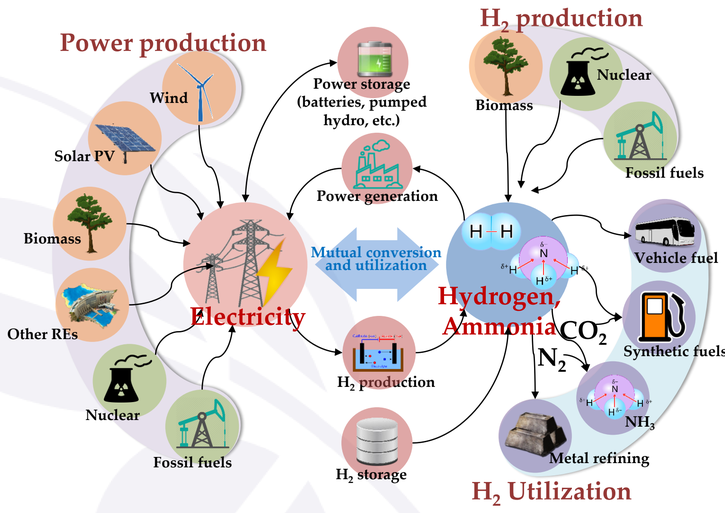
A highly efficient and clean energy system is developed toward the realization of sustainable society. Analysis and modeling of micro- to macro-scales for each individual energy conversion process and elemental technology are performed, together with the effort to integrate them efficiently. In addition, a mutual relationships (conversion, utilization, and storage) among the electricity, chemical energy, and other carbon-free secondary energy sources is also studied.



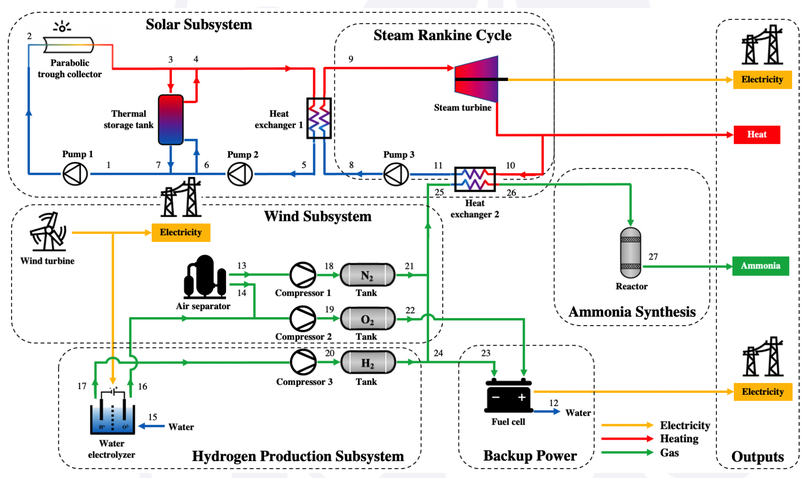
Research area and vision



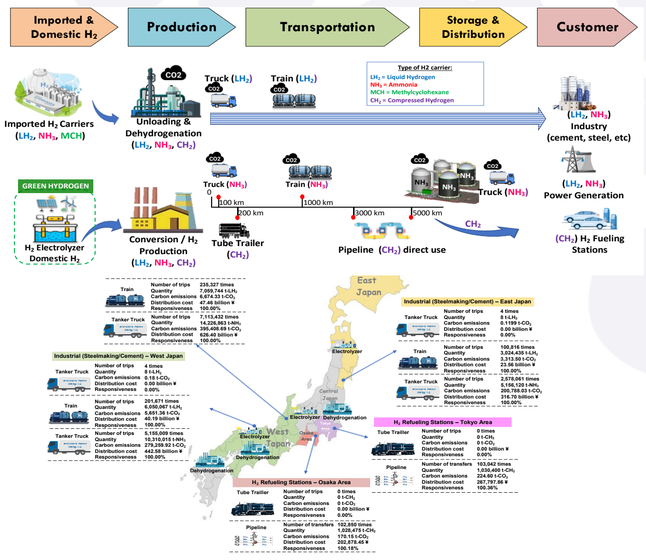
Relationships of carbon-free secondary energy sources



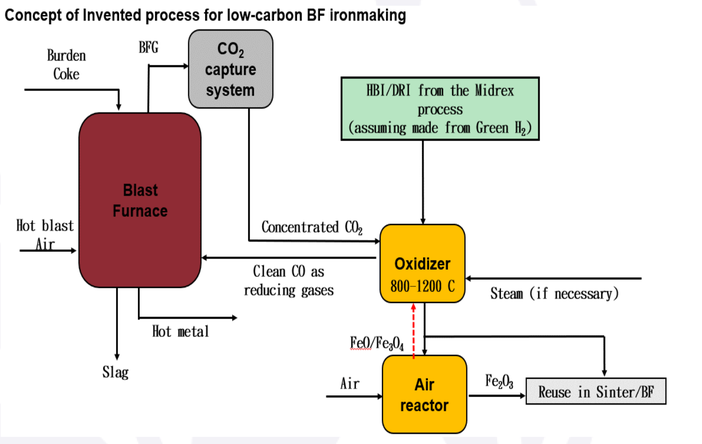
Mutual utilization of electricity and hydrogen-based fuels toward zero-carbon



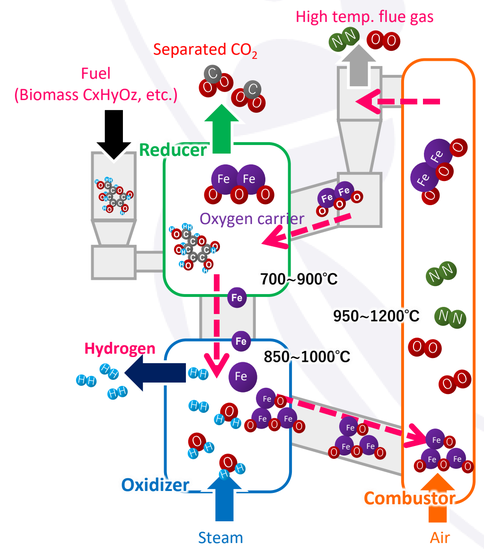
Schematic of the integrated renewable multi-generation system (H_2, electricity, heat, and fuels)



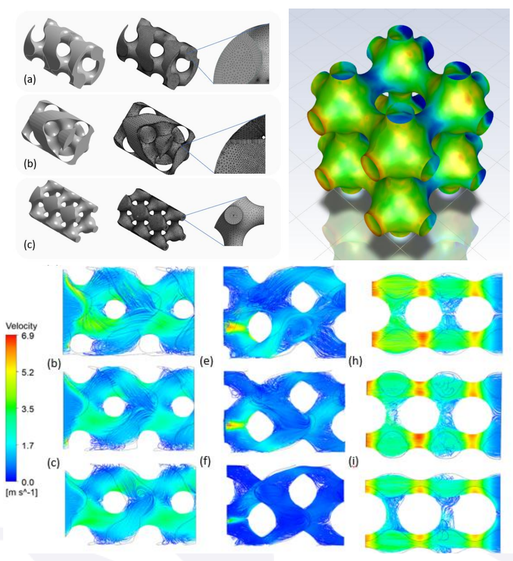
Hydrogen and ammonia supply chain



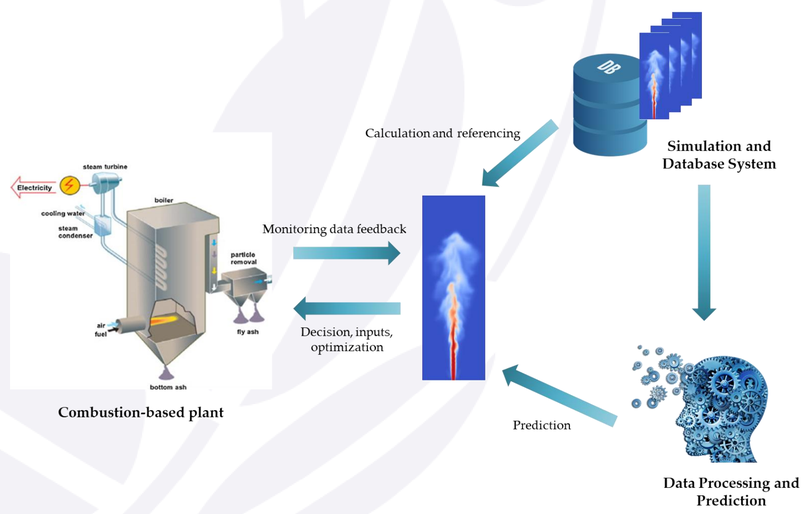
Decarbonization in industrial processes (iron/steel-making, cement, chemicals, etc.)



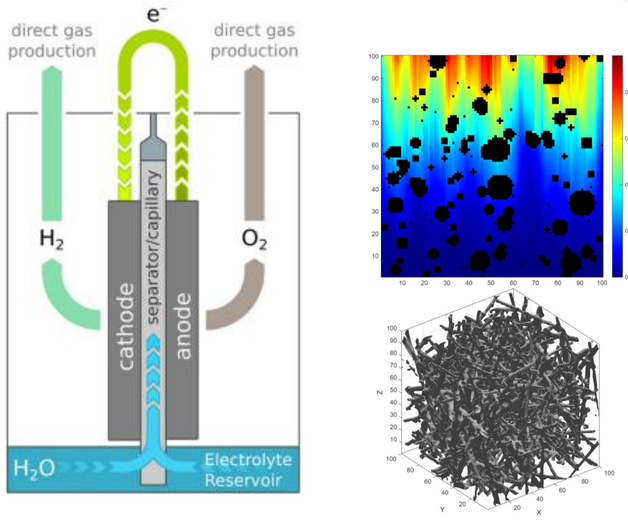
CO2-free chemical looping hydrogen production system



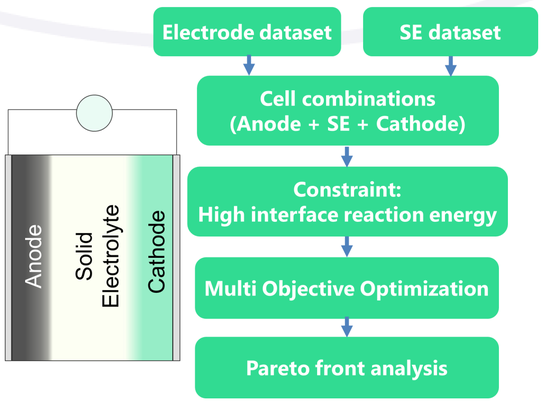
Metamaterial-based metal hydride hydrogen storage



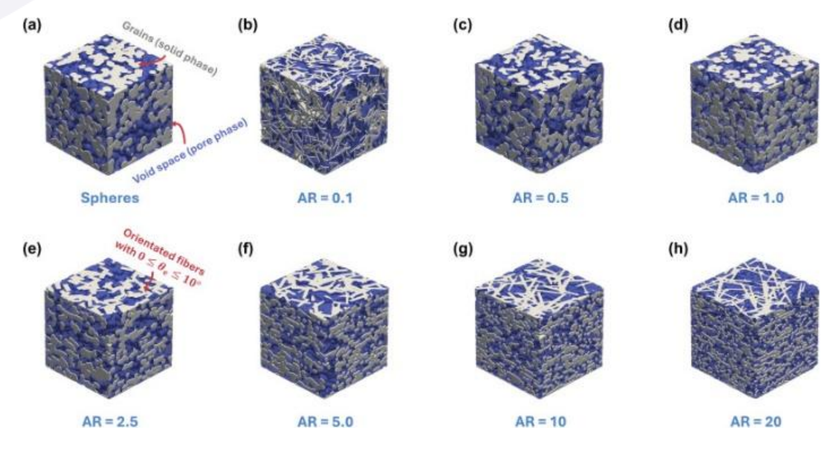
Advanced combustion modeling and prediction



Development of capillary-fed electrolyzer



Material informatics for optimum material selection and combination for solid-state batteries



Nano/microscopic structure development for electrochemical devices