Electrochemistry and the Energy Storage Gap

Science of Small Objects for Global Problems

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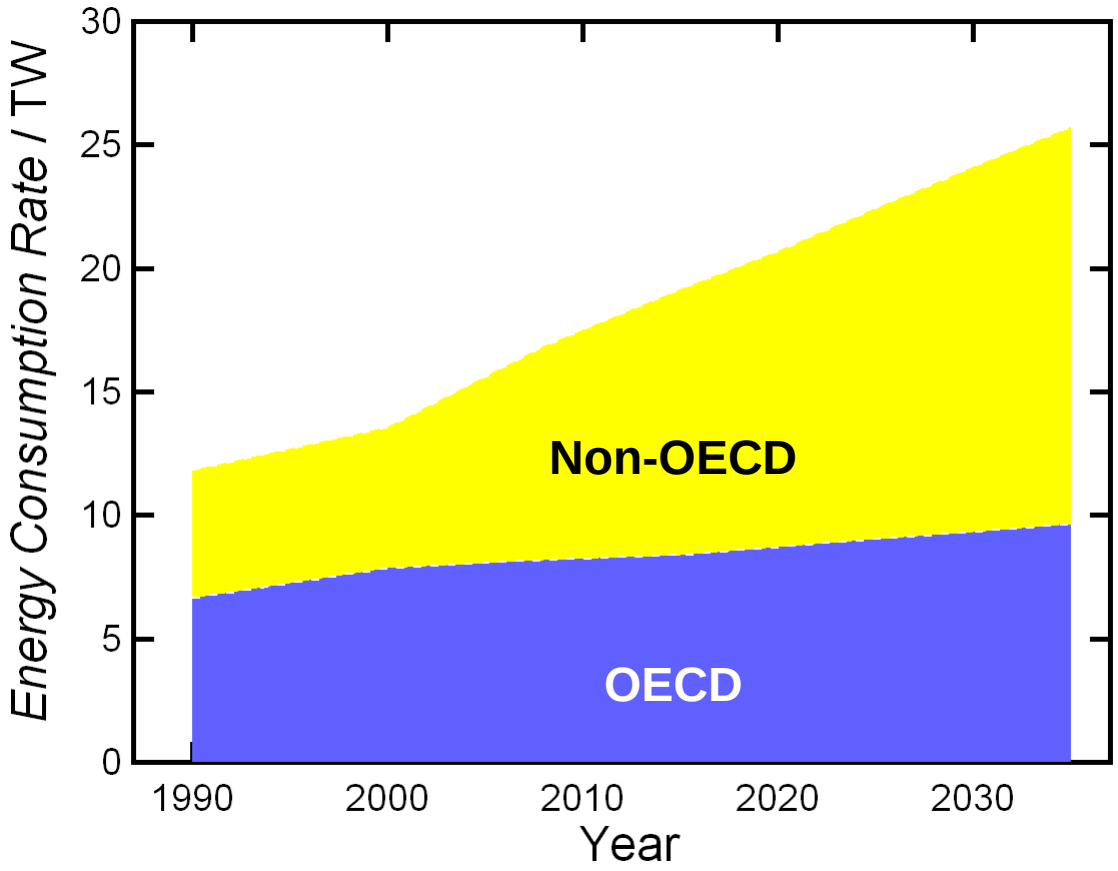
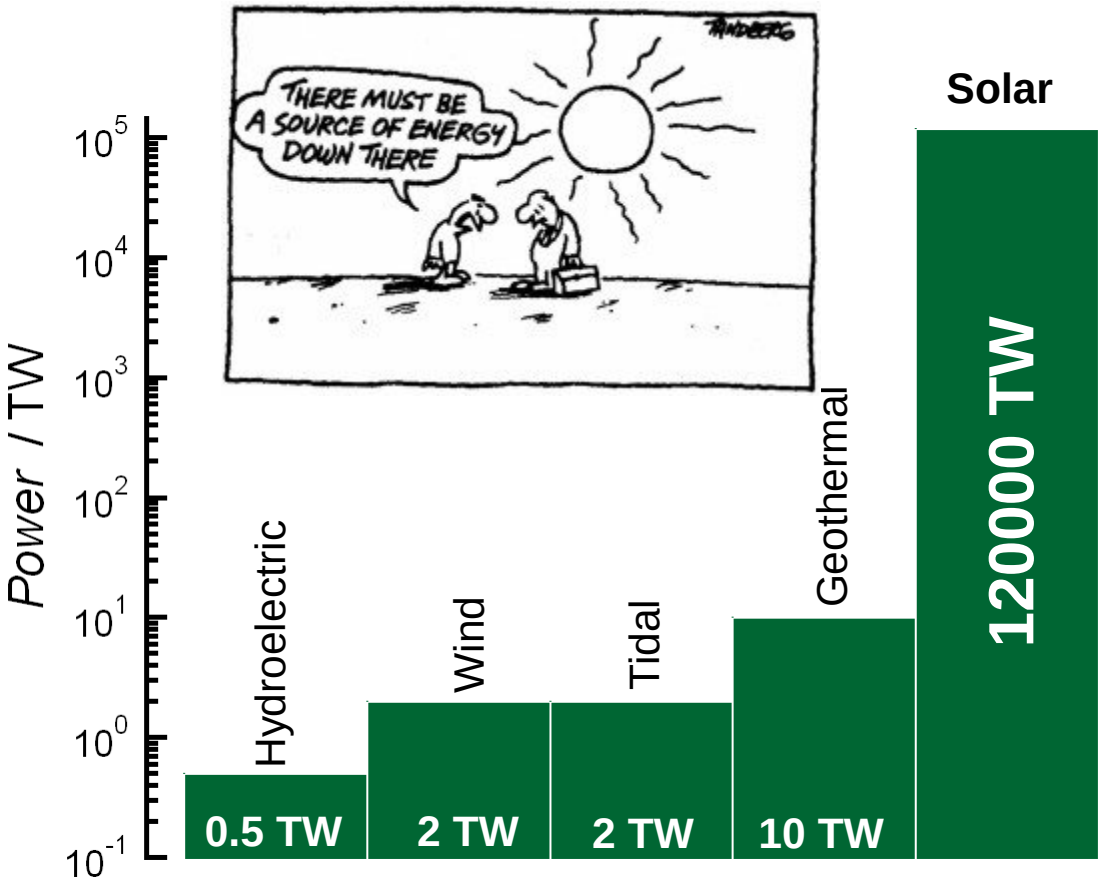
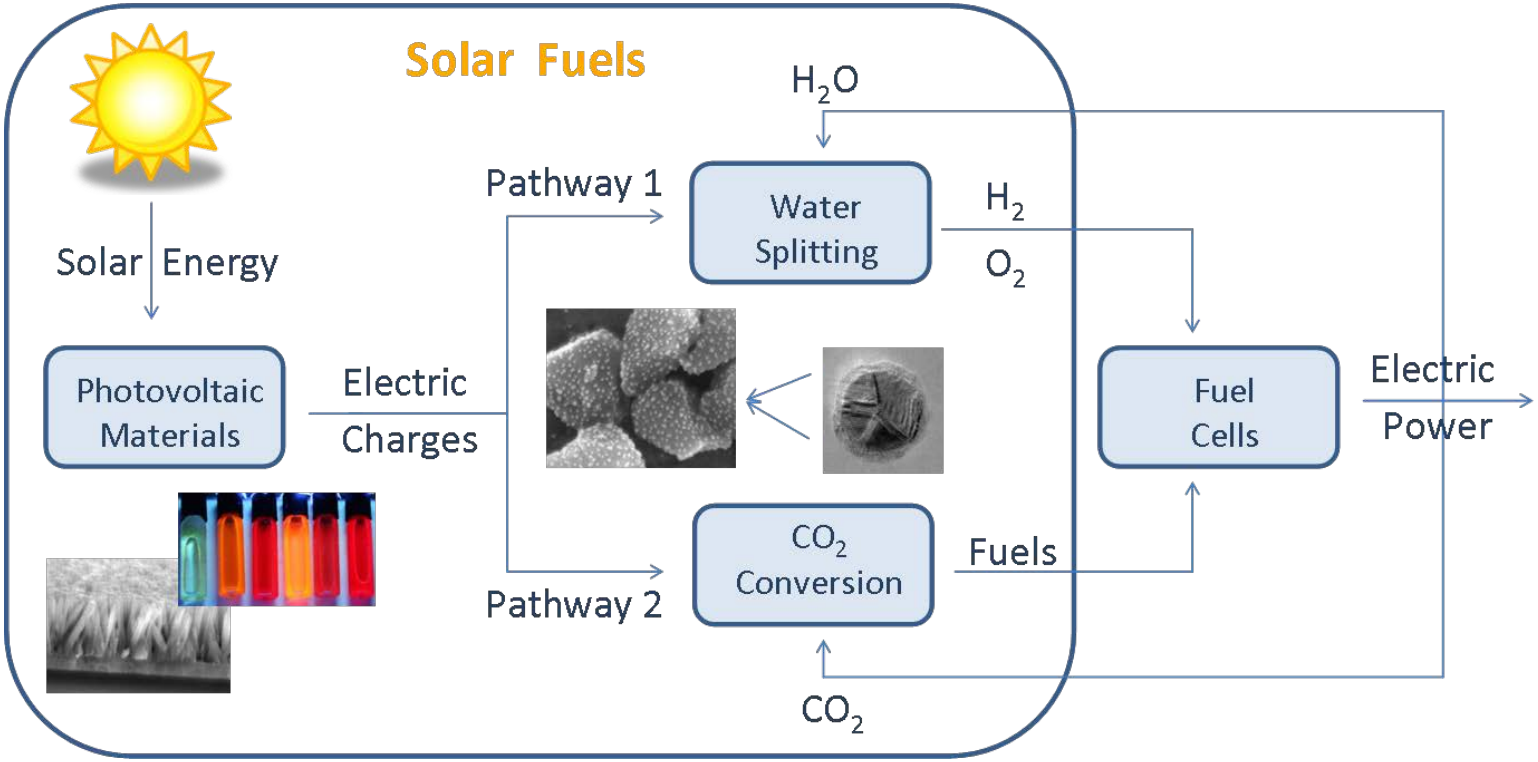
Global Energy Consumption Rate



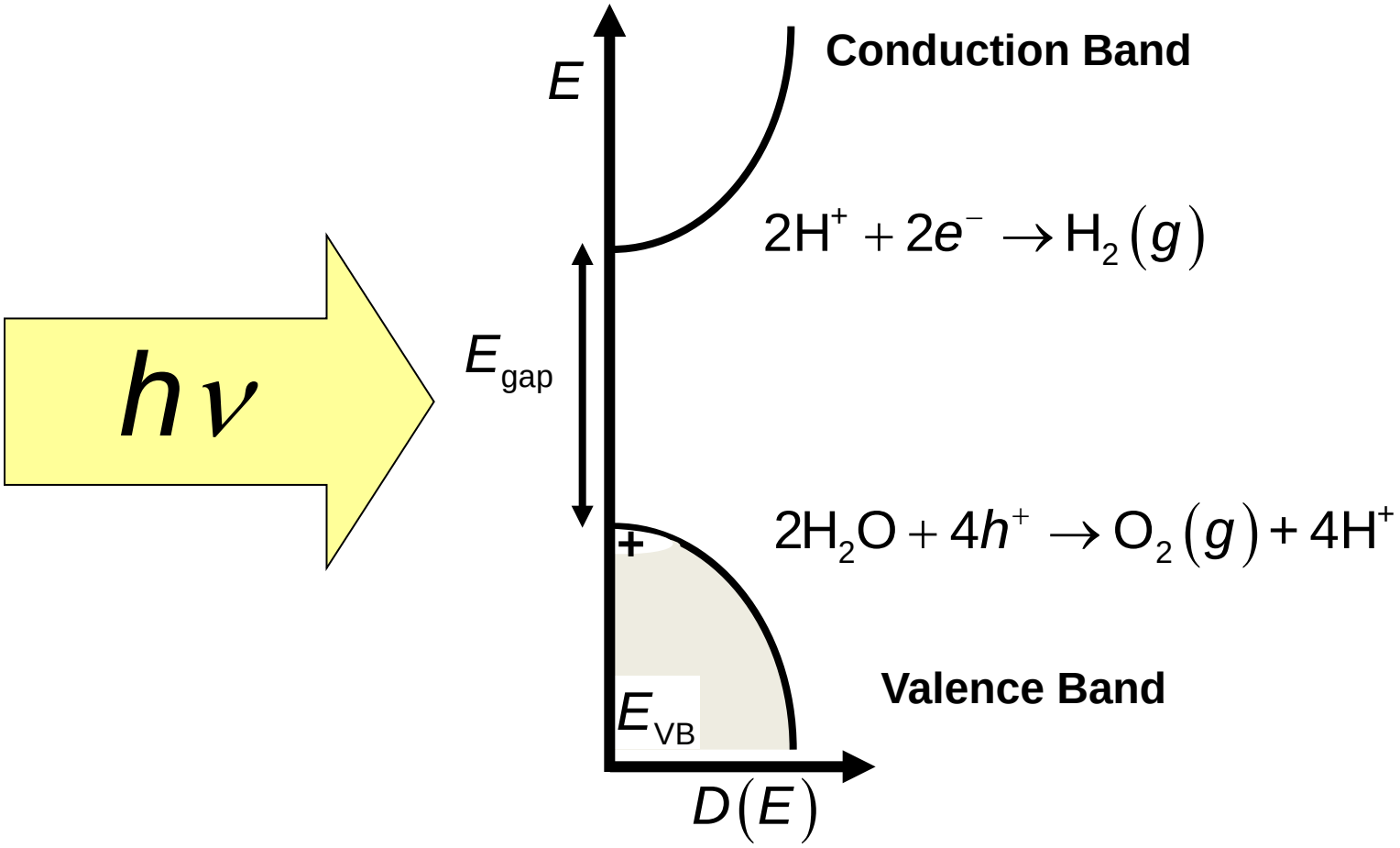
Maximum Power Available From Renewable Sources



Energy Nano-Economics

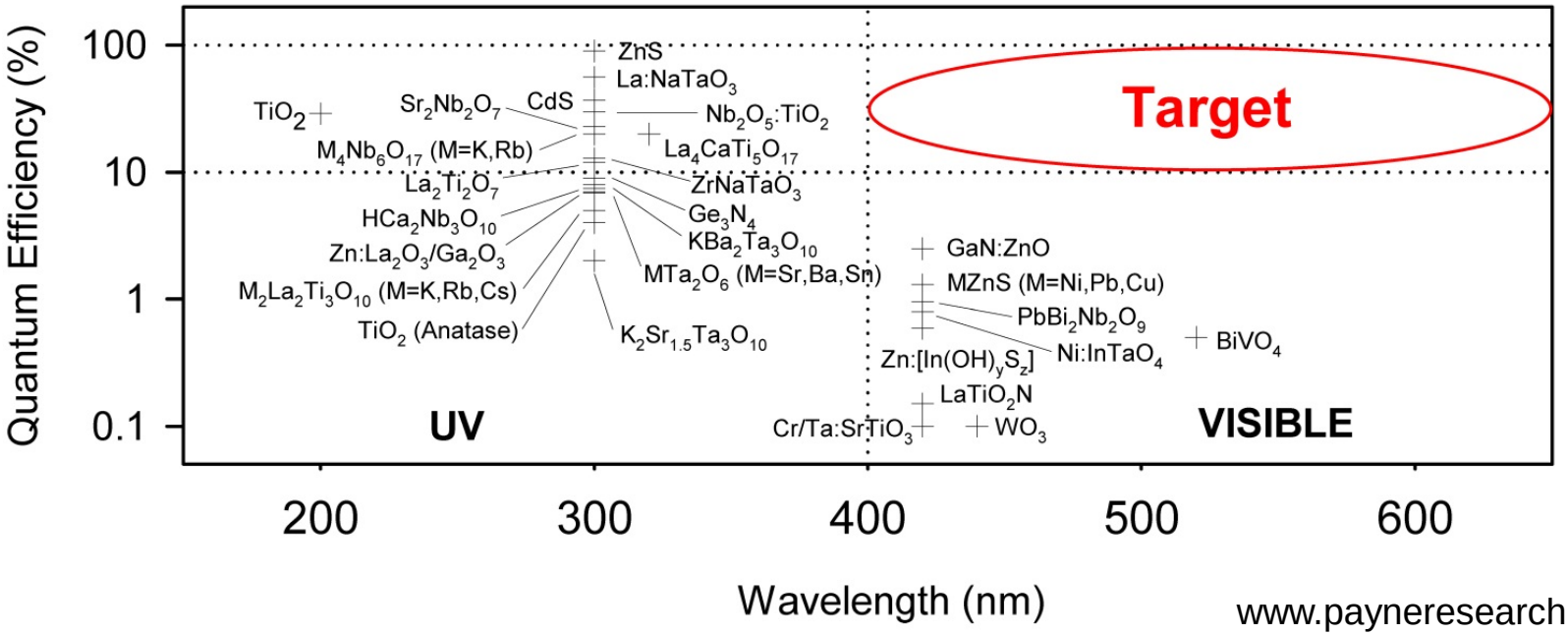


Solar Energy Conversion to Fuels – Water Splitting



Solar Energy Conversion to Fuels – Water Splitting

Stable Materials – Oxides – Efficient Water Oxidation



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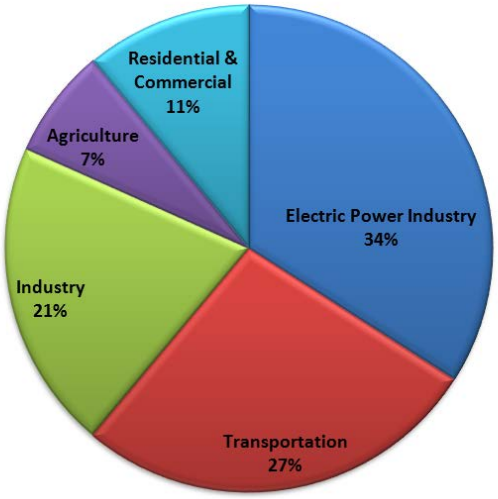
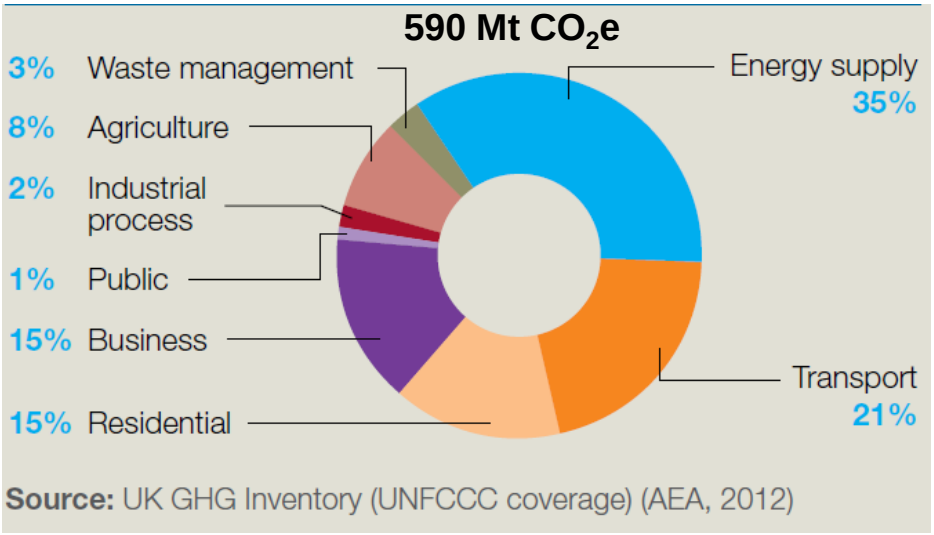
Solar Energy Conversion to Fuels: CO_2 to Fuels

U.S. Greenhouse Gas Emissions by Sector 2010

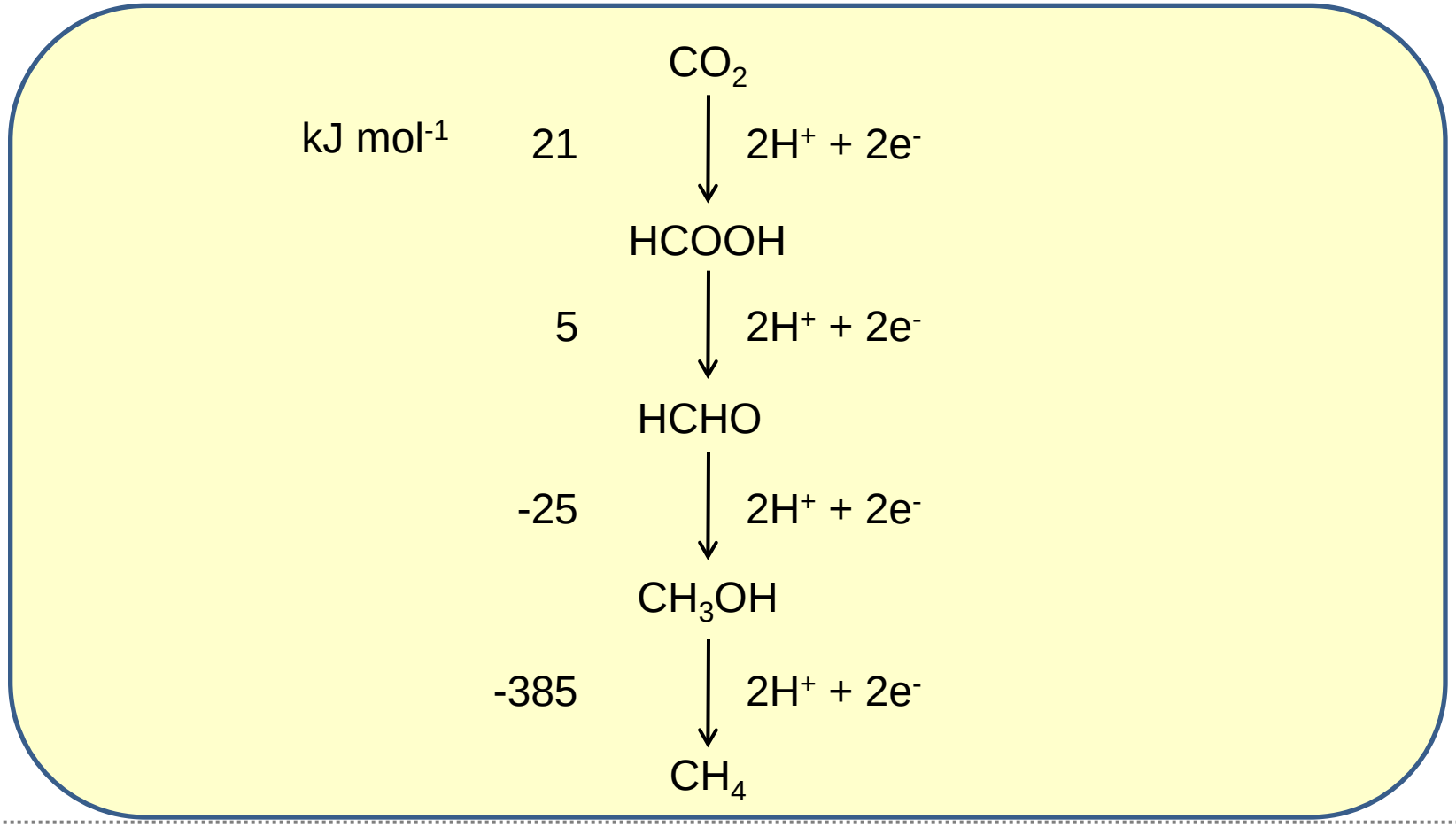


Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2010 (EPA 2012)

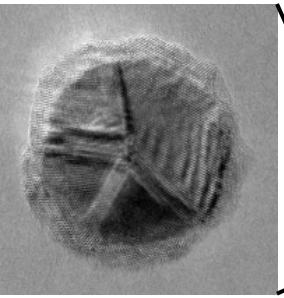


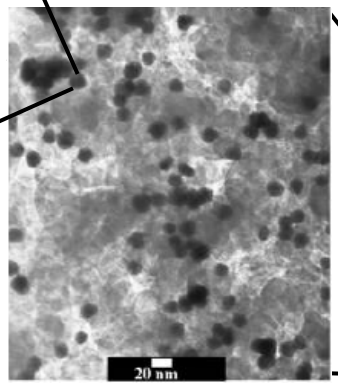
- Solar power driven electrochemical reactors for CO_2 conversion

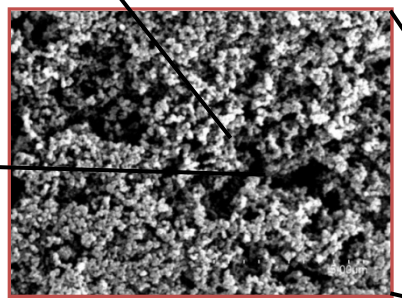
Electrochemical Conversion of CO_2 to Fuels

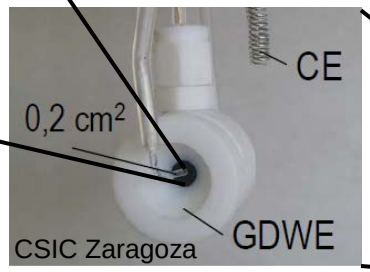


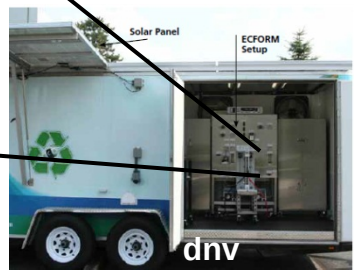
Electrochemical Conversion of CO_2 to Fuels

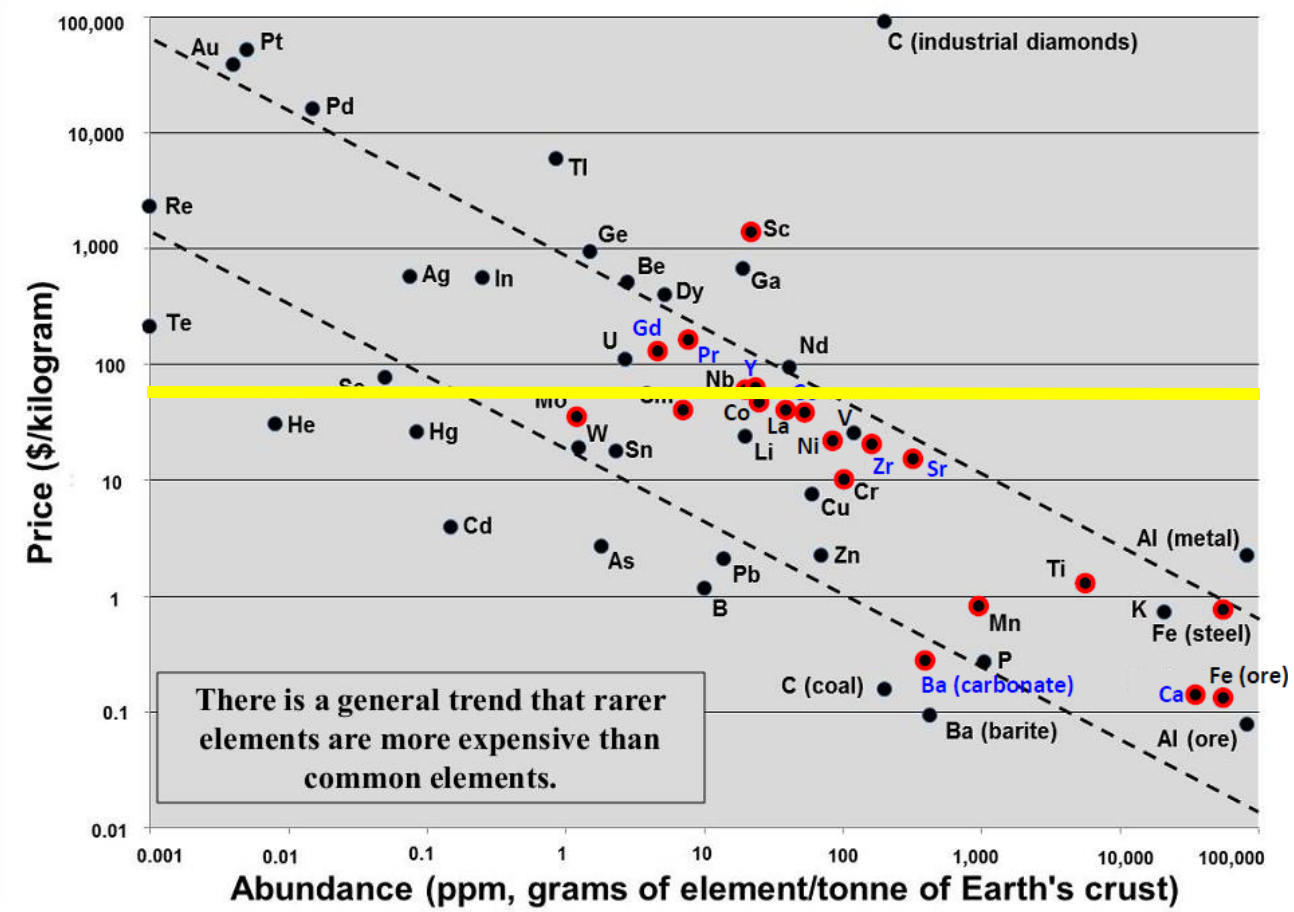












Source of figure: R Jaffe & J Price, 2011, APS reports on Energy Critical Elements
Their Source of data: USGS, EIA, CRC Handbook of Chemistry and Physics, others
Additions estimated via http://www.lynascorp.com/page.asp?category_id=1&page_id=25, www.alibaba.com and for abundance, wikipedia

Concluding Remarks

- TW Solar: conversion and storage in stable chemical bonds
- Water-Splitting: Functional oxides (oxygen catalysis)
- CO_2 conversion to fuels: selective catalysts
- Abundant and low-cost Materials (> 100 $/Kg)