How to produce sustainable fuels and chemical feedstocks from CO_2 and rust?

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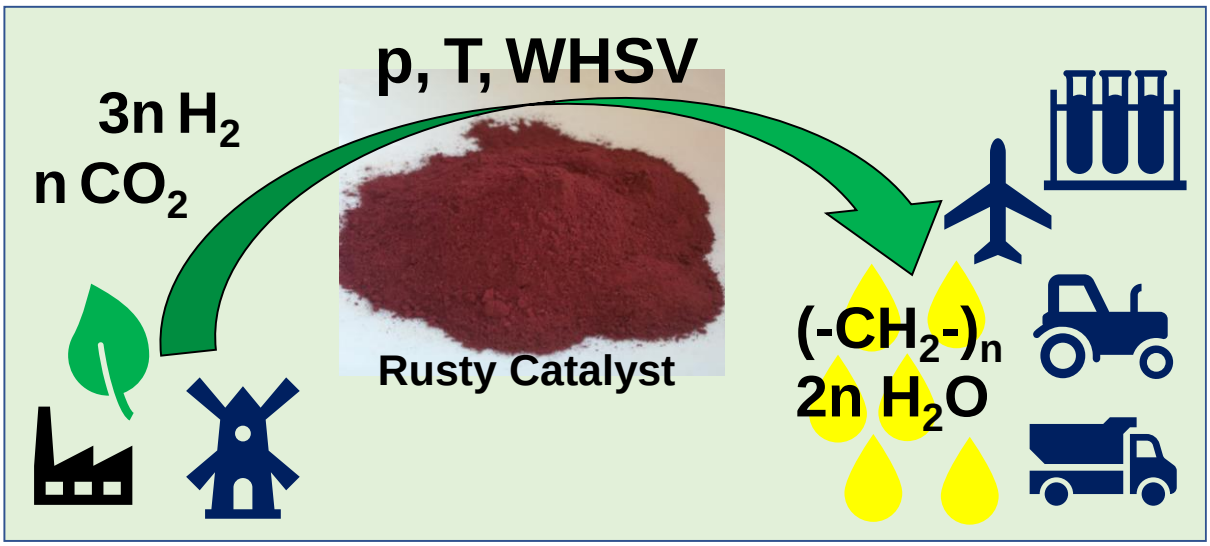
Abstract

This lecture focuses on the production of sustainable fuels and chemical feedstocks as a key strategy for achieving a greenhouse gas-neutral society. The proposed approach is based on the conversion of CO_2 and H_2 according to the Fischer-Tropsch synthesis using iron oxide catalysts (see scheme below). CO_2 can be captured either directly from the air or from unavoidable industrial emissions, such as those from the cement and glass industries, while hydrogen can be supplied through biomass gasification or water electrolysis powered by photovoltaic or wind energy.

The catalytic conversion of CO_2 yields a broad spectrum of hydrocarbons, including olefins, paraffins, and oxygenated compounds such as alcohols and ketones. The lecture will highlight relevant process conditions, the complex reaction mechanism and the catalytically active iron phases, and will discuss the technological potential of the CO_2-based Fischer-Tropsch synthesis, with particular emphasis on the production of sustainable aviation fuel ("green kerosene").



Scheme: CO_2-based approach to produce sustainable fuels and feedstocks.