R & D facts

U.S. Department of Energy
Office of Fossil Energy
National Energy Technology Laboratory

OSTA
Hydrogen Research

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Hydrogen Production from H_2S and H_2S-Containing Waste Gases

The focus of this research is to develop an economical and commercially viable technology to directly convert H_2S and waste gases that contain hydrogen sulfide into valuable hydrogen and sulfur products.

Objective

As the nation moves toward a hydrogen-based economy, NETL's Hydrogen Production/Reforming Research Group is investigating methods to produce hydrogen and sulfur from waste gases. Hydrogen, as a clean alternative fuel, holds promise as a blend for internal combustion engines, to power fuel cells, and to upgrade crude oil, develop chemicals, and produce liquid fuels in refineries. Despite its enormous potential, hydrogen to date cannot be economically produced from waste gases. Investigators are developing advanced materials and technology that can economically convert H_2S and H_2S-containing waste gases into hydrogen and sulfur.

In-House Research Laboratory

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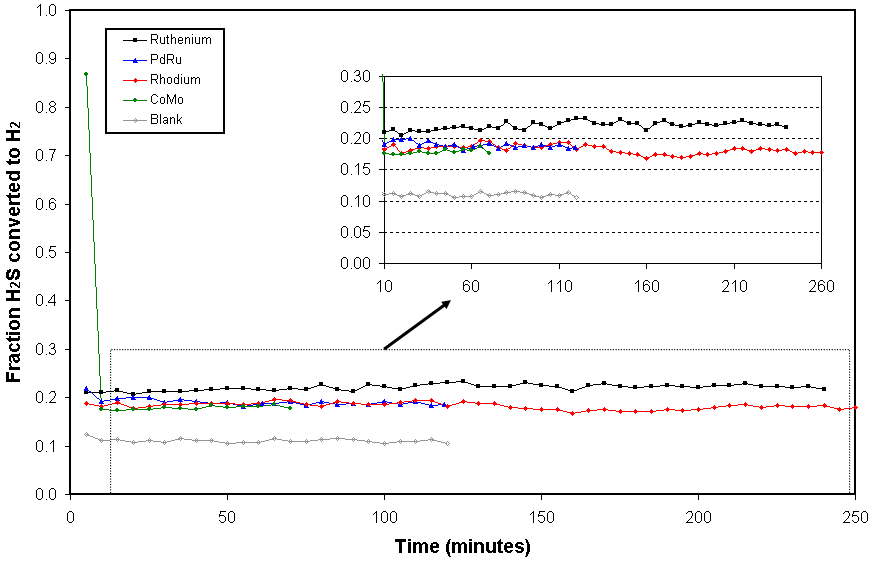
Current Activities

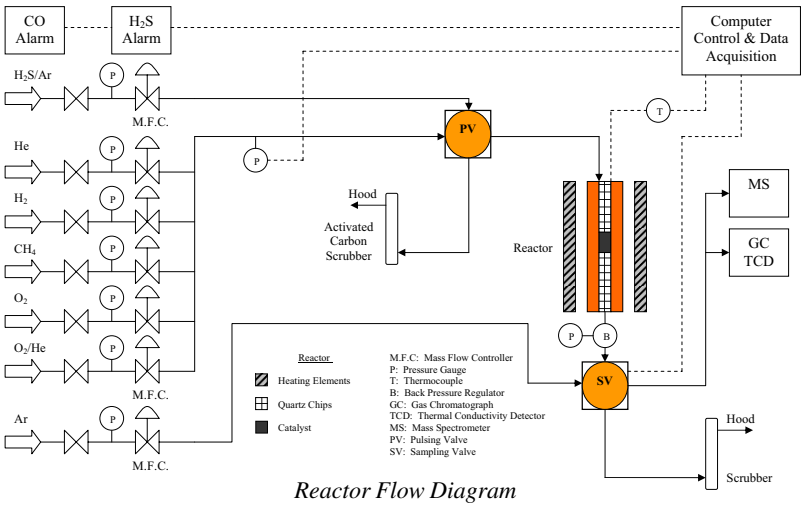
- Novel catalyst preparation
- Catalyst testing
- Catalyst characterization
- Systems studies
- Computational chemistry

Description

The Group focus is on solving technical problems associated with the development of a catalytic process to convert H_2S an H_2S-contaning waste gases into hydrogen and sulfur in an environmentally acceptable manner. The major challenge facing the Group is the recombining of hydrogen and sulfur when hydrogen sulfide (H_2S) is decomposed by either removing hydrogen or sulfur from the reaction products. Therefore, the Group will (1) develop a highly active catalyst that is resistant to sulfur poisoning; it will conduct basic and applied research, integrated with computational and system studies, on new and novel catalysts used to produce hydrogen; the Group is collaborating with NETL's hydrogen-separation and fuel cell teams and will test the best performing catalyst in the membrane reactor; (2) study the effects of sulfur removal from the reaction products by integrating the catalyst with sulfur-removing materials that react with sulfur and removing it from the reaction products; (3) integrate a sulfur-tolerant membrane reactor developed at NETL to examine the effects of hydrogen removal from the reaction products on shifting the equilibrium in favor of producing more hydrogen.



Catalytic Conversion of H_2S into Hydrogen and Sulfur at 850°C
(Significantly higher amount of hydrogen produced in the presence of catalyst)



Reactor Flow Diagram

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