

## **Hydrogen: A Small Molecule with Large Impact**

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### **Abstract**

The first section of the presentation will provide general information about hydrogen including physical data, natural abundance, production and consumption figures.

This will be followed by detailed information about current industrial production routes for hydrogen. Main on-purpose production for hydrogen is by classical steam reforming (SR) of natural gas. A brief overview of most important steps in steam reforming is given including reforming section, CO conversion and gas purification. Also the use of heavier than methane feedstocks and refinery off-gases is discussed.

Alternative routes for hydrogen production or production of synthesis gas are autothermal reforming (ATR) or partial oxidation (POX). Pros and Cons for each specific technology are given and discussed.

Gasification, especially gasification of renewable feedstocks, is a further possibility to produce hydrogen or synthesis gas. New developments and current commercial processes are presented.

Hydrogen from electrolysis plants has only a small share on the hydrogen production slate, but in some cases this hydrogen is a suitable feedstock for niche applications with future potential. Finally, production of hydrogen by solar power as a new route is discussed.

The final section focuses on the use of hydrogen. Classical applications are hydrogenation reactions in refineries, like HDS, HDN, hydrocracking and hydrofinishing. But, with an increased demand for liquid fuels for transportation or power supply, hydrogen becomes a key player in future as an energy source. Use of hydrogen in synthesis gas for the production of liquid fuels via Fischer-Tropsch synthesis or coal liquefaction is discussed as well as use of pure hydrogen in fuel cells.