REFORM, REACTION, AND RESOURCES pdf

1: Rand Tumbles As Government Warns Of "Catastrophe" Unless 'Land Reform' Allowed | Zero Hedge

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Examples of catalyst shapes used are spoked wheels, gear wheels, and rings with holes. Additionally, these shapes have a low pressure drop which is advantageous for this application. The United States produces nine million tons of hydrogen per year, mostly with steam reforming of natural gas. The worldwide ammonia production, using hydrogen derived from steam reforming, was million metric tonnes in The reaction takes place in a single chamber where the methane is partially oxidized. The reaction is exothermic due to the oxidation. When the ATR uses carbon dioxide the H2: CO ratio produced is 1: CO ratio produced is 2. The advantage of ATR is that the H2: CO can be varied, this is particularly useful for producing certain second generation biofuels , such as DME which requires a 1: Partial oxidation Partial oxidation POX is a type of chemical reaction. It occurs when a substoichiometric fuel-air mixture is partially combusted in a reformer, creating a hydrogen-rich syngas which can then be put to further use. Advantages and disadvantages[edit] The capital cost of steam reforming plants is prohibitive for small to medium size applications because the technology does not scale down well. However, analyses have shown that even though it is more costly to construct, a well-designed SMR can produce hydrogen more cost-effectively than an ATR. The main reactions are: Reforming for fuel cells[edit] Advantages of reforming for supplying fuel cells[edit] Steam reforming of gaseous hydrocarbons is seen as a potential way to provide fuel for fuel cells. The basic idea for vehicle on-board reforming is that for example a methanol tank and a steam reforming unit would replace the bulky pressurized hydrogen tanks that would otherwise be necessary. This might mitigate the distribution problems associated with hydrogen vehicles ; [16] however the major market players discarded the approach of on-board reforming as impractical. Disadvantages of reforming for supplying fuel cells[edit] The reformerâ€"fuel-cell system is still being researched but in the near term, systems would continue to run on existing fuels, such as natural gas or gasoline or diesel. However, there is an active debate about whether using these fuels to make hydrogen is beneficial while global warming is an issue. Fossil fuel reforming does not eliminate carbon dioxide release into the atmosphere but reduces the carbon dioxide emissions and nearly eliminates carbon monoxide emissions as compared to the burning of conventional fuels due to increased efficiency and fuel cell characteristics. The cost of hydrogen production by reforming fossil fuels depends on the scale at which it is done, the capital cost of the reformer and the efficiency of the unit, so that whilst it may cost only a few dollars per kilogram of hydrogen at industrial scale, it could be more expensive at the smaller scale needed for fuel cells. The reforming reaction takes place at high temperatures, making it slow to start up and requiring costly high temperature materials. Sulfur compounds in the fuel will poison certain catalysts, making it difficult to run this type of system from ordinary gasoline. Some new technologies have overcome this challenge with sulfur-tolerant catalysts. Coking would be another cause of catalyst deactivation during steam reforming. Olefins, typically ethylene, and aromatics are well known carbon-precursors, hence their formation must be reduced during the SR. Additionally, catalysts with lower acidity were reported to be less prone to coking by suppressing dehydrogenation reactions. H2S, the main product in the reforming of organic sulfur, can bind to all transition metal catalysts to form metalâ€"sulfur bonds and subsequently reduce catalyst activity by inhibiting the chemisorption of reforming reactants. Meanwhile, the adsorbed sulfur species increases the catalyst acidity, and hence indirectly promotes coking. Precious metal catalysts such as Rh and Pt have lower tendencies to form bulk sulfides than other metal catalysts such as Ni. Rh and Pt are less prone to sulfur poisoning by only chemisorbing sulfur rather than forming metal sulfides. Solid oxide fuel cells SOFC and molten carbonate fuel cells MCFC do not have this problem, but operate at higher temperatures, slowing start-up time, and requiring costly materials and bulky insulation.

2: Steam reforming - Wikipedia

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