Catalytic Hydrogen Production

Thermal Splitting of Water at Low Temperatures Using Nano-Structured Cobalt

Key Features:
- Efficient generation of hydrogen to power fuel cells/electric vehicles/etc.
- Safe, on-demand production eliminating the need for hydrogen storage
- Clean fuel with no greenhouse gas emissions when hydrogen produced by renewables

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The Hydrogen Economy

Delivering energy with hydrogen

Advantages
• Clean → H₂O
• Efficient → Up to 85%
• Renewable
• No Greenhouse Gases
• Existing Technologies

Disadvantages
• Not a Source of Energy
• Expensive to Produce
• Difficult to Store
• Highly Flammable Gas
• Infrastructure Needed

Catalytic Hydrogen Technology solves these problems
SEM Images of Synthesized Nano-Structured Cobalt Particles
Catalytic Hydrogen Technology

- Batch reactors for \( \text{H}_2 \) generation

![Diagram of batch reactor](image)
Catalytic Hydrogen Technology

\[ Co\ (s) + CO_2(g) + H_2O(l) \rightarrow CoCO_3(s) + H_2(g) \]

\[ 2\ CoCO_3(s) + H_2O(l) \rightarrow Co_2O_3(s) + H_2(g) + 2\ CO_2(g) \]

- Process is catalytic in CO\textsubscript{2}
- Uses only Water, CO\textsubscript{2} and Cobalt at basic pH
- Cobalt regenerated by several methods
- Hydrogen production easily controlled (T & P)
- Safe, clean, efficient Hydrogen production
Next Steps

• Continuous H₂ Generator
• Optimize & Improve Yield (currently 30 %)
• Couple with fuel cell for prototype system
• Acquire additional funds for tech development
• Secure utility patent/PCT
  – Provisional patent filed March 20, 2017
    “Catalytic Hydrogen Production”
    (Docket No.: SLW 4724.011PRV, UML 2017-006)