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Sulfur Tolerant Micro-Membrane Reactor for Hydrogen Generation & Separation

UW ID: 13-090

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Patent Status:

Patent Pending

Description of Technology

Coal and natural gas resources are expected to provide a large percentage of global energy over the next several decades. Advanced technologies are being developed to promote cleaner, more efficient, and environmentally friendly use of these energy resources. Recent hydrogen separation/purification technologies have become a promising approach for utilizing these abundant energy resources with minimized pollution to the environment. Among these technologies, hydrogen separation membranes or compact catalytic membrane reactors (CCMR) have been widely used in industry due to their cost effectiveness. A CCMR typically includes a membrane that has a catalytic film which induces a reaction as the coal syngas passes through in order generate hydrogen gas. However, membrane reactors for hydrogen generation and separation have been found to be susceptible to contaminants found in coal derived syngas, such as sulfur.

University of Wyoming researchers have overcome this problem of sulfur contamination. The created sulfur-tolerant micro-membrane reactor (MMR) combines sulfur catalysts and a cutting-edge palladium film technology for hydrogen generation and separation. The sulfur tolerant MMR is fabricated with three layers: an outer catalytic layer where the initial reaction happens produce H₂; a middle substrate layer as support for both the catalytic layer and the palladium layer; and a palladium layer which separates the H₂ is from mixture gases to achieve higher purity.

Applications

The presented solution has the potential to significantly improve the hydrogen generation and separation process within the energy industry.

Features & Benefits

- Sulfur-tolerant
- Significant reduction in sulfur contamination
- Achieves high purity hydrogen gas
- Cost effective

Market Opportunity

Recently, hydrogen separation/purification technologies have been expanded to nearly eliminate all carbon emissions, which has been one of the major challenges within the energy industry. This technology has the opportunity to be used on a global scale.



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