Environmentally-Friendly Hydrogen Production and In-Situ Carbon Dioxide Removal

Technology #m08-020

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Carbon Dioxide Emissions from Coal Burning Power Plants Cause Global Warming:
Fossil fuel amounts to more than 86% of energy consumption in the world. The burning of fossil fuels produces around 21.3 billion tonnes of carbon dioxide per year. Since natural processes can only absorb about half of that amount, there is a net increase of 10.65 billion tonnes of atmospheric carbon dioxide per year. Carbon dioxide is one of the greenhouse gases that contribute to global warming, which may cause major adverse effects. This calls for technological improvements that enable energy production with limited-, and ultimately zero-emission of carbon dioxide. During the process of generating clean hydrogen from coal to run solid oxide fuel cells, efficient method of absorbing carbon dioxide while still allowing highly pure hydrogen production need to be implemented.

Environmentally-Sound Carbon Dioxide Emission Removal:
The current invention describes a novel high surface area monolith substrate coated with reforming catalysts impregnated with carbon dioxide absorber. It provides a means to produce highly pure hydrogen with very low carbon monoxide contamination and simultaneous carbon dioxide removal. The coating and impregnation method allows the absorbers to be continually regenerated. In addition, the coated monolith substrates may be used at lower temperature and pressure, thereby lowering restrictions on reaction conditions for hydrogen production and carbon dioxide capture. Finally, there is negligible attrition of the material during operation because it is fixed to the substrate.

Applications:
- Systems for generating hydrogen and separating carbon dioxide
- Zero-emission coal alliance power plant

Advantages:
- Large surface area structure allowing for high efficiency
- Lower operating temperature and pressure
- Highly pure hydrogen production
- Very low carbon monoxide contamination and simultaneous carbon dioxide sequestration
- Multiple regeneration cycles
- Extended operating life compared to particle systems


Licensing Status: Available for Licensing and Sponsored Research Support

Publications: A.G. Belova, T. M. Yegulalp, and C. T. Yee, Feasibility Study of In Situ CO2 Capture on an

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