UNIVERSITY OF WYOMING
RESEARCH PRODUCTS CENTER

Developing transformational catalytic chemical looping refining technology for fuel and chemical extraction from coal

UW ID: 16-051

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Patent Status:
Patent Pending

Description of Technology

Coal is currently needed to meet our energy requirements, but there are concerns about the carbon dioxide (CO_2) emissions resulting from its wide-spread combustion. Conventional Combustion Looping (CL) processes work at high temperatures and are therefore energy intensive. Furthermore, the major outcomes of conventional CL processes are not value-added chemical and fuel products.

To solve this problem, researchers at the University of Wyoming have worked to develop a catalytic low-temperature CL-pyrolysis based low-CO_2-emsision coal refinery (CLT-CLP-B-LCECR) technology. It mainly consists of two parts: a catalytic pressurized steam pyrolysis reactor (CPSPR) and a catalytic oxygen carrier regenerator (COCR). Fe_2O_3 or rare-earth promoted Fe_2O_3 (REP-Fe_2O_3) is used as a catalytic oxygen carrier (COC). The overall objective of this technology is to develop a transformational catalytic low-temperature CL-pyrolysis based coal refinery or CLT-CLP-B-LCECR technology. This new technology will lower CO_2 emissions in the energy industry and results from the process including value-added chemical and fuel products such as olefins, naphtha, diesel, paraffin, and carbon materials.

Applications

Chemical looping (CL) processes offer an effective and versatile reduction-oxidation scheme that can convert coal into electricity, hydrogen, liquid fuels and valuable chemicals while providing a low-cost CO_2 capture pathway.

Features & Benefits

- Fixes the past downfalls associated with Combustion Looping
- Significantly reduce CO_2 emission.
- Waste water generated during the CLT-CLP-B-LCECR will be consumed internally in the steam pyrolysis reactor.
- Produces value-added carbon materials (e.g., char, which can be processed into needle coke, activated carbon, carbon black, carbon fiber, graphite, and graphene); also chemicals including olefins, naphtha and paraffin, and fuels such as diesel.

Marketing Opportunities

The CLT-CLP-B-LCECR technology is designed to create a win-win scenario for both environmental protection and economic development in Wyoming and the country.

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