



# Regenerable Mixed Copper-Iron-Inert Support Oxygen Carriers for Solid Fuel Chemical Looping Combustion Process

## Opportunity

This patent-pending technology, "Regenerable Mixed Copper-Iron-Inert Support Oxygen Carriers for Solid Fuel Chemical Looping Combustion Process," provides a metal-oxide oxygen carrier for application in fuel combustion processes that use oxygen. This technology is available for licensing and/or further collaborative research with the U.S. Department of Energy's National Energy Technology Laboratory.

## Overview

Researchers have extensively studied the use of metal-oxide oxygen carriers for the delivery of oxygen via reduction of the oxygen carrier during the application of chemical looping combustion. These combustion systems, which produce a concentrated stream of  $\text{CO}_2$ , potentially have significant advantages over, for example, combustion with air that requires expensive  $\text{CO}_2$  separation technologies prior to  $\text{CO}_2$  sequestration. Despite certain advantages, success has been limited due to insufficient durability and reactivity of the metal-oxide oxygen carriers. To address the above issues, copper (Cu)-based oxygen carriers have been extensively studied for the combustion of both gaseous and solid fuels. Although Cu-based carriers demonstrate a high reactivity for fuel combustion in chemical looping combustion systems, their relatively low melting point has generated severe agglomeration problems at higher temperatures. As a result, researchers have also evaluated  $\text{Fe}_2\text{O}_3$  as an oxygen carrier. Although this carrier has improved temperature stability versus CuO, its reactivity is significantly limited.

This patent-pending technology addresses the above issues by providing for an oxygen carrier that demonstrates improved durability and reactivity versus metal oxides currently used in the chemical looping combustion of fuels. The carrier is composed of a combination of metal oxides offering increased reactivity per unit weight and enhanced physical durability and reactivity during multiple cycling combustion-regeneration reactions. The carrier is an optimum combination of CuO and  $\text{Fe}_2\text{O}_3$  on an inert support that is reactive with fuels and provides excellent efficiency and combustion rates at relatively low temperatures.

## Patent Details

U.S. Non-Provisional Patent Application No. 13/159,553; titled "Regenerable Mixed Copper-Iron-Inert Support Oxygen Carriers for Solid Fuel Chemical Looping Combustion Process."

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## Significance

- Provides an oxygen carrier with an optimum combination of CuO and  $\text{Fe}_2\text{O}_3$
- Uses include chemical looping combustion of solid/gaseous fuels
- Improves durability and reactivity over metal oxides
- Mitigates agglomeration problems

## Applications

- Any application involving chemical looping combustion of solid fuels

December 2012