TECHBRIEF

ENCAPSULATION METHOD FOR MORE DURABLE REACTIVE MATERIALS

OPPORTUNITY:

The invention describes a method of encapsulating reactive materials (i.e., catalyst, sorbent or oxygen carrier) within a porous, unreactive, strong outer layer to increase attrition resistance while retaining sufficient reactivity. This technology is available for licensing and/or further collaborative research from the U.S. Department of Energy's National Energy Technology Laboratory.

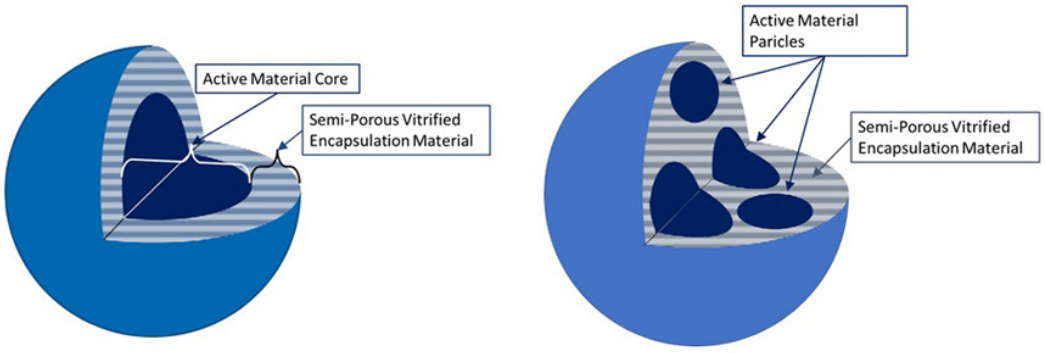
CHALLENGE:

Processes that involve fluidized bed or transport reactors require pellets with high attrition resistance because the pellets move continuously in the reactor during operation. Loss of pellets due to attrition contributes to high replacement costs and operational difficulties. Most processes that involve catalyst, sorbents and oxygen carriers operate in fluidized beds or circulating fluidized beds and require high attrition resistance for long-term operations. In addition, loss of reactive materials with low melting points, such as CuO, due to agglomeration is an issue. Pellets with high attrition resistance are needed to combat against loss of reactive materials.

OVERVIEW:

NETL researchers have developed an encapsulation method to create more durable reactive materials. The reactive materials are encapsulated within a porous, unreactive, strong outer layer. This method has been used for the preparation of an oxygen carrier for chemical looping combustion.

Researchers coated oxygen carrier pellets with reactive materials such as CuO and Fe_2O_3 with a layer of porous inert material to obtain the pellets containing reactive material in the core. Reactive materials with low melting points can also be incorporated in the pellets. This porous coating still allows reactive gases to freely transport through the pellet while avoiding the agglomeration of pellets. Attrition tests of the oxygen carrier pellets in a bench-scale fluidized bed reactor revealed that encapsulation substantially improved oxygen carrier pellet durability as compared to unencapsulated pellets. This NETL technology offers various advantages over conventional technologies for attrition resistance.



Encapsulated Active Material: Active component resides in the core of the pellet. A semi-porous vitrified encapsulating layer is constructed around active components.

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ADVANTAGES:

- Significantly enhances attrition resistance of the reactive materials, reducing material replacement costs and boosting long-term operating efficiencies.
- Prevents agglomeration of pellets containing reactive materials with a low melting point.
- Simple and Low-cost.
- Has a broad range of applications that are suitable for the encapsulation of a variety of materials that move continuously during operations.

APPLICATIONS:

- Combustion
- Gasification
- Catalytic processes
- Sorption processes

PATENT STATUS:

U.S. Patent Pending (non-provisional patent application)

Filed: 09/13/2019

Title: *Encapsulation Method for Preparation of Pellets with High Attrition Resistance*

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NETL Reference No: 18N-23

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