



# Control of Slag Chemistry for the Reduction of Viscosity and Refractory Corrosion

## Opportunity

Research is active on the patent pending technology, titled “Basic Refractory and Slag Management for Petcoke Carbon Feedstock in Gasifiers.” This technology is available for licensing and/or further collaborative research from the U.S. Department of Energy’s National Energy Technology Laboratory.

## Overview

Current industrial practice mixes petcoke and coal as a carbon feedstock for gasification. Slag from these mixtures can only contain a very limited amount of vanadium oxide ( $V_2O_5$ ) due to its effects on slag viscosity. Because  $V_2O_5$  has a high melting temperature, it causes unfavorable slag flow characteristics, which can cause the gasification process to be difficult to control due to the potential for slag buildup. Higher gasification temperatures can be used to dissolve  $V_2O_5$  solid, however increased temperature results in increased refractory corrosion and decreased refractory service life. Standard high chrome oxide refractory liners used to contain the gasification reaction have the potential for high lining wear, which would increase with higher gasification temperature because of the high amount of  $V_2O_5$  content in petcoke slag. The effect of slag chemistry changes and reduced slag viscosity on refractory wear needs to be taken into consideration when mixed feedstocks are used for gasification.

The current invention describes methods to control slag chemistry for both the reduction of slag viscosity and refractory wear in gasification systems. Application of this methodology to control slag chemistry will minimize refractory corrosion caused by carbon feedstocks containing petcoke and allow for the use of non-high chrome oxide refractory materials.

## Patent Details

U.S. Non-provisional Patent Application No. 13/661,170 was filed October 26, 2012, titled “Basic Refractory and Slag Management for Petcoke Carbon Feedstock in Gasifiers.”

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## Significance

- Greater ease in controlling slag viscosity during gasification
- Ability to control (and lower) gasifier operational temperatures
- Reduces material corrosion leading to increased refractory service life
- Potential to use lower amounts of slag conditioners or to reduce the amount of coal added to petcoke slags, increasing energy efficiency and reducing raw material costs
- Allows for use of refractory lining materials other than high chromium oxides
- Increases vanadium slag content making it more economical to recover

## Applications

- Gasification, refractory, and power industries where control of slag viscosity and reduce refractory wear is desired
- Technology would be applicable to metals and mining industries especially those having high slag vanadium content

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