

# Synthesis of nanostructured zinc oxide and application in warm fuel gas desulfurization

## Overview

The fuel gas (syngas) produced from gasification of biomass and solid waste can be utilized in gas engines, gas turbines or fuel cells for power generation. However, prior to application, syngas needs to be purified from sulfur compounds such as H<sub>2</sub>S and COS. Nanostructured ZnO sorbents are developed that outperform existing commercial ZnO desulfurization products.

## Key features

- Nanostructured ZnO desulfurization sorbent with up to 10 times higher adsorption capacity compared to commercial ZnO.
- It can be compacted into pellets or immobilized on any support using the developed fabrication protocol.
- Sorbents loaded on honeycomb provide additional benefits of low pressure drop and unobstructed gas flow.

## Sulfur removal by desulfurization sorbents

Sorbent	Total sulfur capacity at breakthrough time (mg S / g ZnO)
Commercial ZnO	4.6 ± 0.3
ZnO-nanorods (1)	9.0 ± 1.9
ZnO-nanorods (2)	12.0 ± 5.1
ZnO-nanosheets	48.7 ± 11.1

## Applications

- Desulfurization of warm fuel gas (syngas) produced from coal, biomass, municipal solid waste, etc

## Market opportunities

- Biomass, municipal solid waste, coal gasification plants integrated with power generation.
- Syngas purification for chemical synthesis (e.g., methanol, Fischer-Tropsch synthesis, hydrogen, etc.).

## Advantages and benefits

- High application temperature compared to conventional processes (200-600 °C).
- High desulfurization capacity.

