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Role of potassium in the enhancement of the catalytic activity of calcium oxide towards tar reduction

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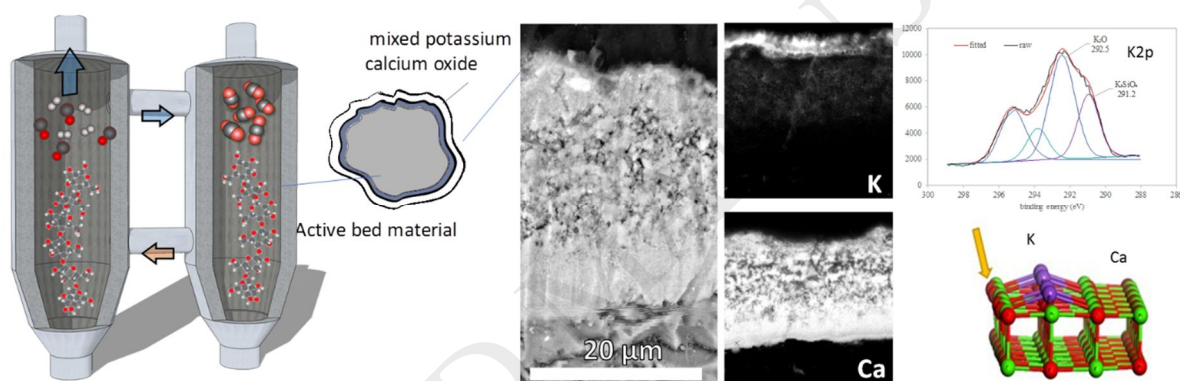
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Graphical abstract



Highlights

- Potassium was used as in-bed additive for enhancing the catalytic activity of olivine towards tar decomposition in a 30 MWth DFB gasifier
- K-enriched Ca-oxide in the form of an outer layer on olivine particles has been pointed as the catalytically active surface for tar reduction. The mixed phase has been identified through SEM-EDS and XPS
- DFT theoretical calculations were used to develop a mechanism loop for tar reduction based on ethylene as a model tar

Abstract

Gasification in fluidized bed systems is considered to be a highly promising alternative for the thermal conversion of biomass. A major challenge for this process is the formed tars, which represent a loss of energy from the product gas and entail additional costs for their removal. Olivine is considered to be the most effective catalytic bed material in terms of its impact on tar levels in the product gas. Additions and modifications to olivine have revealed the potential to enhance its catalytic activity. In the present study, the effect of the addition of K_2CO_3 to the gasification process on the tar

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