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Steam gasification of poultry litter biochar for bio-syngas production

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Highlights

- A detailed assessment of reaction rate throughout the gasification was performed.
- Maximum reaction rate of hydrogen was observed between 3-6 min at 900°C.
- The elevated H₂ yield may be associated with AAEMs present in the biochar.
- Bio-syngas obtained presented high potential to reduce iron ore in steel industry.

Abstract: Poultry litter, the major waste generated by poultry farming, has its main use in soil as a fertilizer. However, the uncontrolled use of poultry litter for this purpose can result in environmental impacts such as the emission of methane, a greenhouse gas. Therefore, the thermochemical conversion of this waste can be a solution to this problem, since its products can be converted into useful energy. In this work, pyrolysis experiments were conducted in a tubular reactor, using N₂ atmosphere and a final temperature of 800°C. Furthermore, the steam gasification of poultry litter biochar obtained in the pyrolysis experiments was investigated in a fixed-bed tubular reactor at different temperatures (800, 850 and 900°C). The maximum hydrogen (H₂) reaction rates were observed in the first 15 minutes of the reaction, and there was a change in the maximum reaction rate towards lower reaction times with increased temperature. The elevated H₂ yield may be associated with metals present in the biochar, especially potassium (K). Bio-syngas (H₂ + CO) obtained from steam gasification of poultry litter

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