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Hydrogen chloride removal from wood waste-derived syngas using inorganic sorbents

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Wood waste is an attractive feedstock for syngas production via pyro-gasification, due to its good fuel properties, abundant supply, and low recycling rate. However, wood waste may contain significant levels of chlorine, which may form hydrogen chloride (HCl) in gasifiers, which in turn may cause corrosion in syngas end-use devices, as well as health and environmental problems. A promising technique to remove HCl from syngas is by dry adsorption of HCl onto solid inorganic sorbents. In this paper, we present an experimental study on the adsorption potential of four sorbents: two industrial solid residues– CCW-S and CCW-D, and two commercial sorbents – Bicar and Lime. The first set of adsorption tests were performed using a gas mixture of 200 ppm HCl in nitrogen (HCl/N₂) at ambient conditions. The results revealed that Bicar was the best performing sorbent with an average breakthrough time of 66 h and a HCl adsorption capacity of 27 wt%, whereas the performance of the solid residues was lower (e.g. 7.8 h and 4 wt% for CCW-S). When the adsorption tests were conducted with a simulated HCl/Syngas atmosphere, a significant decrease in sorbent performance was observed which indicated that inhibitory interactions occurred between syngas and the sorbents, in relation to HCl adsorption. Our results reveal a promising opportunity to valorize industrial residues as cheap and effective sorbents for the removal of HCl in syngas. This will enable a wider market penetrating of wood waste-derived syngas, while meeting the quality requirements of increasingly strict environmental regulations.

Biography

Augustina EPHRAIM obtained a Masters degree in Chemical Engineering from Imperial College London in 2012 and has recently completed her 3 year PhD programme in Process and Environmental Engineering at Ecole des Mines d'Albi in France.

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