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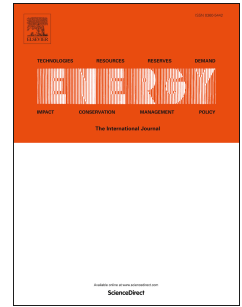
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ENERGY RECOVERY FROM PLASTIC AND BIOMASS WASTE BY MEANS OF FLUIDIZED BED GASIFICATION: A LIFE CYCLE INVENTORY MODEL

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ABSTRACT

The study provides for the first time a life cycle inventory model for the fluidized bed gasification of wastes, based on a large amount of high-quality data. All of them have been obtained from a pilot scale fluidized bed gasifier, fed with ten types of waste and biomass, under a wide range of operating conditions. The model refers to commercial scale gasifiers having a “thermal configuration”, where the generated syngas is immediately burned downstream of the reactor. Key relationships between process- and waste-specific parameters have been defined. The model quantifies the main inputs and outputs of the gasification process (emissions, energy recovery, ash disposal, resource consumptions), providing high-quality data that could contribute to improve life cycle assessment modelling of waste gasification. Finally, some case studies have been implemented in the EASETECH software to illustrate the model applicability, evaluate the role of main parameters, and compare the environmental performances of gasification power units with that of the European electricity mix. The performances appear highly affected by metal contents in the waste-derived fuels, while the model results to a limited extent are sensitive to the equivalence ratio and the net electrical efficiency of the energy conversion.

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