

Three-dimensional MP-PIC simulation of bubbling fluidized bed gasification of waste plastic (SRF)

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Converting non-recyclable plastics to fuels is acknowledged as an environmentally sustainable solution. Such fuels, including solid recovered fuel (SRF) that contains substantial fraction of plastics, can be used in pyrolysis, gasification, and combustion processes. A three-dimensional CFD model for gasification of SRF in a bubbling fluidized bed gasifier is developed. The gas phase is described using large eddy simulation (LES) approach and solid phase was described using Multiple Particle-in-Cell (MP-PIC) method. CFD simulation integrates an extended kinetic chemistry model. The extended kinetic chemistry model includes SRF pyrolysis, gas-char reactions, gas-gas reactions, C₂-C₃ hydrocarbons and tar partial oxidation and steam reforming reactions. Tar is represented using phenol and naphthalene as model compounds. The results were compared with experimental data obtained using a lab scale reactor with internal diameter of 114 mm and 1 m height.