

MODELING OF ASH DEPOSITION ON THE WALL OF A HIGH TEMPERATURE THERMAL REFORMER

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Gasification of biomass is a suitable approach allowing the conversion of non-homogeneous biomass into a homogeneous intermediary, syngas. High thermal conversion of char and tar intermediates can only be achieved at high temperatures ($> 1300\text{oC}$) without the addition of a catalytic system. Such an approach however can induce melting of inert ashes coming with the feedstock, which can stick to the reactor wall, thus possibly leading to agglomeration/clogging problems, as well as leaching of the refractory if not properly controlled. One possible way to address ash deposition is to use a cooling system at the reactor walls. The deposited slag layer acts as refractory itself, so that the inner temperature becomes high enough to exceed the ash solidification temperature. The new deposited ashes then flow down along the walls in liquid phase, and can be collected and disposed. A transient 2D model was developed and implemented to describe the evolution of the slag layer on a reformer walls. The effect of operating variables on the layer thickness was studied through sensitivity analysis. The model equations were also used to devise a set of dimensionless numbers that can fully characterize the slag behaviour in the system. These numbers were used to downscale the thermal reformer into a cold transparent bench. The latter will be used for model calibration and validation regarding slag fluid dynamic behavior.