Heat Transfer in a Fixed Biomass Char Bed

A thermal conductivity model based on the Yagi and Kunii model together with a bed model was developed to describe the thermal conductivity of a straw char bed. The bed model describes the relationship between the distance between particles and the external porosity. To verify the model, thermal conductivity experiments were performed on a wheat straw sample, which were cut in a shredder with two different sieves, 4 and 8 mm, and packed loosely in the thermal conductivity apparatus. The model, using external porosity and char diameter, compared reasonably well with experiments. The two straw samples were also packed densely, and the model, using measured external porosity together with the diameter from the loosely packed sample, compared reasonably well with experiments. The verified model was used in a parametric study to evaluate the effect of gas flow rate, particle diameter, porosity and temperature on the thermal conductivity.