Evaluation, comparison and validation of deposition criteria for numerical simulation of slagging

Abstract:

This publication deals with a comparison of various sticking probabilities based on three different approaches: (1) Viscosity models, (2) experimental results based on ash fusion and thermo-gravimetry and (3) thermodynamic equilibrium calculations. More specifically the viscosity models of Urbain, Kalmanovitch and Watt & Fereday are compared. Sticking probabilities from ash fusions are based on the characteristic temperatures and the sample height. The thermo-gravimetric results combine the mineral phase change in dependence of temperature and the mass loss due to evaporation of minerals. The thermodynamic equilibrium calculations make use of the software FactSage and cover the liquid phase of the ash. The derived criteria are compared among each other and implemented in an applicable form in Fluent in order to determine the deposition rate for an entrained flow reactor. The results are then compared with experimental observations for two different hard coals, El Cerrejon and Pittsburgh No. 8. An optical deposition-rate measurement technique is applied to the experiments, which makes use of a shadow image of the deposition probe.

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