Application of thermochemistry for the prediction of slagging in coal fired boilers

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Slagging and fouling of coal fired boilers is still a practical and theoretical problem. This topic is investigated since decades. Because of the permanent change of the fuel quality, a lot of R&D as well as practical effort is still required to reduce downtimes due to slagging. The present study summarizes the investigation of slagging for two coal qualities from the Lusatian area, whereas sporadic massive slagging of the boiler is the objective. Many process samples (coals, deposits, fly and wet ash) was analyzed and a mechanism of deposit formation and subsequent slag formation is developed. Beside other methods, FactSage™ and SimuSage™ was applied, to simulate the slagging for different operation modes (cola/air ratio) and fuel qualities. The main challenge is the definition of the thermodynamic system. From the detailed analysis of the process samples, many processes within the boiler are far away from chemical equilibrium. Beside kinetical restrictions, especially the enrichment/depletion of ash components in the specific boiler areas have to be considered. Based on different system definitions (i.e. models), results are presented.