Magnesium bisulfite spent liquor combustion – computational fluid dynamic simulation of liquid fuel spraying

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Abstract:

The objective of this study is to optimize the combustion of magnesium bisulfite spent liquor in an industrial combustion chamber supported by computational fluid dynamic simulations. The main process steps of the chemical recovery in magnesium bisulfite pulping processes are the combustion of the magnesium bisulfite spent liquor, the hydration of MgO from the ash, and a multistage absorption of SO_2 from the exhaust gas using the recovered magnesium hydroxide. The pulping process is very sensitive to soot in the system, which may be transported to the pulp during SO_2 recovery after insufficient combustion of magnesium bisulfite spent liquor. To avoid soot, the complete combustion of black liquor has to be ensured by establishing a stable combustion system providing sufficient oxygen, a suitable black liquor spraying and proper temperature zoning. In this study, optimal spraying characteristics of the magnesium bisulfite spent liquor are investigated using computational fluid dynamic simulations. The spraying of magnesium bisulfite spent liquor into a combustion chamber is simulated using a Lagrangian particle approach in the open-source simulation environment OpenFOAM®. The simulations support identifying an optimized magnesium bisulfite spent liquor spraying to minimize soot formation. The poster presents first results of the simulation of magnesium bisulfite spent liquor spraying into a combustion chamber.