Examination of the Corrosion Resistance of Calcium Hexaaluminate based Low cement castable against Biomass Slag

Lise Loison, Thorsten Tonnesen*
RWTH Aachen University, Institute of Mineral Engineering,
Mauerstr. 5 D-52064 Aachen. Germany

Emmanuel de Bilbao, Jacques Poirier
CNRS, CEMHTI UPR3079
1D, avenue de la Recherche Scientifique
CS90055
45071 Orléans cedex 2, France

* Presenting author: Thorsten Tonnesen,

Refractory linings used in incinerators for energy production must adapt to the energy transition, where fossil fuels tend to be replaced by biomass, exposing the lining to different range of chemical compositions. The use of alternative combustibles impacts the life expectancy of the refractory products due to corrosion reactions, whose complexity originates in the variety of the biomass sources. Mullite, Al_2O_3-Cr, or SiC based refractory products are heretofore used in incinerators, however refractory containing Calcium-Hexaaluminate (CA_6, $CaO{\cdot}6Al_2O_3$) could be an alternative, because of its high refractoriness and high resistance against alkali attack. This work aims to describe and understand the chemical resistance brought by the presence of hexaaluminate of lime in a Low Cement Castable (LCC).

In order to outline the degradation mechanisms induced by biomass, this study focus on the impact of wood ash and aim to understand the effect of its main oxides, namely CaO, SiO_2 and K_2O on the high temperature corrosion. Thermodynamic calculations were performed using the FactSage computation package to calculate reactions, precipitations and dissolution of different refractory phases, materials and raw materials respectively in contact to the biomass slag. Experimental results of corrosion tests and microstructural changes of the refractory materials are discussed in regard of the thermodynamic predictions.