Potassium capture by coal fly ash K₂CO₃, KCl and K₂SO₄ - DTU Orbit (31/08/2019)

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The potassium capture behavior of two coal fly ashes at well-controlled suspension-fired conditions was investigated through entrained flow reactor (EFR) experiments and chemical equilibrium calculations. The impact of local reaction conditions, i.e., the type of K-salts (K₂CO₃, KCl or K₂SO₄), K-concentration in flue gas (molar K/(Al + Si) ratio in reactants), reaction temperature, and coal ash type on the reaction was studied. The results show that the K-capture level of coal fly ash at a K-concentration of 500 ppmv (K/(Si + Al) = 0.481) was considerably lower than the equilibrium data as well as the measured K-capture level of kaolin. However, at 50 ppmv K (with a molar K/(Si + Al) ration of 0.048), no obvious difference between kaolin and coal fly ash was observed in this work. Comparison of results for different K-species showed that coal fly ash captured KOH and K₂CO₃ more effectively than KCl and K₂SO₄. Additionally, a coal fly ash with higher content of Si and a lower melting point captured KCl more effectively than the reference coal fly ash.

General information
Publication status: Published
Organisations: Department of Chemical and Biochemical Engineering, CHEC Research Centre, Ørsted Bioenergy & Thermal Power
Corresponding author: Wang, G.
Number of pages: 11
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Fuel Processing Technology
Volume: 194
Article number: 106115
ISSN (Print): 0378-3820
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
Original language: English
Keywords: Additive, Biomass combustion, Coal fly ash, K₂CO₃, KCl, Potassium capture
DOIs: 10.1016/j.fuproc.2019.05.038
Source: Scopus
Source ID: 85066999064
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review