MODELLING OF FURNACES AND COMBUSTION SYSTEMS

(641) - AN EXPERIMENTAL AND KINETIC MODELING STUDY OF THE EFFECT OF ALKALI SPECIES ON CO OXIDATION

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Biomass and municipal solid waste may contain significant amounts of potassium, which is mainly released as KCl (g) in thermal conversion processes. The presence of alkali metals may affect formation of regulated species such as CO, NO_x, SO_x, PM and dioxins during thermal conversion in industrial plants. This interaction may depend on several parameters such as concentration of inorganic elements, interaction between gas-gas and/or gas-solid reactions, and operation conditions. In the present work, a research study was conducted to investigate the chemical influence of alkali species on CO oxidation. The role of KCl on the moist oxidation of CO under flow reactor conditions in the absence O_2, as well as under reducing and oxidizing conditions is studied experimentally and interpreted in terms of a chemical kinetic model. The effect of KCl concentration is investigated over a range of stoichiometry, in the 873–1473 K range. The results obtained from the experiments show that presence of KCl has a strong effect on the CO conversion to CO_2 under reducing and oxidizing conditions. Under reducing and oxidizing conditions, gas-phase reactions of K species with free radicals cause a strong inhibition of CO oxidation. Under gasification conditions (absence of O_2), some of the key potassium reactions proceed in the reverse direction and CO oxidation is promoted.

Palavras-chave : Potassium chloride; CO oxidation; Gasification; Reducing; Oxidizing