Rapid nickel oxalate thermal decomposition for producing fine nickel metal powders Part 2: Global kinetics

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Abstract

The global kinetics for the thermal decomposition of nickel oxalate within an aerosol flow reactor are studied by developing a one-dimensional particle phase model that describes the particle behavior within the reactor. The solid precursor is nickel oxalate with an average particle size of 12 mu m. The particles are large enough in size for the gravitational force to cause slip between the particle and fluid phases, thus the particles pass through the reactor slightly faster than the gas phase. The particle residence times for the kinetic study range from 2-6 s for reactor temperatures of 695-767 K. First-order kinetics best fit the experimental conversion data. The decomposition reaction is interpreted as instantaneous nucleation of nano-sized product nickel, followed by two-dimensional growth of these nuclei, controlled by diffusion of product carbon dioxide.

Key words

Nickel, Powder, Kinetic mechanism, Particle flow

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