Simulation of Iron Particle Growth in Aerosol Reactor by Discrete-Sectional Model

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A discrete-sectional model based on the general dynamic equation was developed to simulate particle growth in aerosol reactors. The model can calculate the primary particle size and the aggregate size as well. Particle size distribution and the surface area of the agglomerates can be determined by this model. The model accounts for gas-phase chemical reaction, coagulation and coalescence to determine the size distribution of agglomerates and primary particles. The model was applied to a synthesis of iron particles by thermal decomposition of iron-pentacarbonyl. The effects of operating parameters (temperature, reactant concentration and reactor residence time) on both agglomerate and primary particle size distributions were studied. The model prediction was compared with experimental data and showed good agreement.