

**Intrinsic Reaction and Self-Diffusion Kinetics for Silicon Carbide Synthesis by
Rapid Carbothermal Reduction**

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A one-dimensional non-isothermal model is developed for the “rapid carbothermal reduction” synthesis of fine silicon carbide powders. Intrinsic reaction and self-diffusion kinetics are identified through simulation of the model and comparison to experimental results. The reaction rate follows a shrinking core mechanism and is described by:

$$k = \frac{2.8}{d_p^0} \exp\left(\frac{-3.4 \times 10^5}{RT_m}\right) \text{ s}^{-1}$$

The self-diffusion coefficient for SiC in the aerosol flow reactor is described by:

$$D^* = 1.4 \times 10^{-5} \exp\left(\frac{-4.46 \times 10^5}{RT_m}\right) \text{ m}^2/\text{s}$$