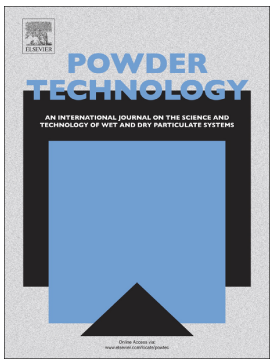

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Numerical Simulation of TiO2 Nanoparticle Synthesis by Flame Spray Pyrolysis

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Abstract

A numerical method of combining CFD with the particle dynamics was developed to study the effect of processing parameters on the formation of TiO_2 nanoparticles by Flame Spray Pyrolysis. The computational model was validated by comparing with experimental measurements and used to predict the effects of production rates, type of dispersion gases and their flow rates. The results show that the predicted particle sizes and flame height are reasonably agree with experimental measurements therefore, it can be used to simulate the FSP process for the production of TiO_2. The simulation results show that when oxygen was used as dispersion gas, the spray flame height increases from 12 to 22.5 cm by increasing the TiO_2 production rate from 16 to 74 g h^{-1}. Similarly, when increasing the liquid feeding rate from 5 to 23.2 mL min^{-1} the flame height is increased from 12.5 to 24 cm using air as dispersion gas. Using air as dispersion gas results in slightly longer flames than that using oxygen. The primary particle diameter is equivalent or slightly smaller when using air instead of oxygen as dispersion gas.