Trajectories of TiO_2 nanoparticles in diffusion flame reactor

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The computational analysis was developed to illustrate the gas temperature and velocity profiles in the oxy-methane diffusion flame reactor during the formation of TiO2 nanoparticles and the collection of the TiO2 nanoparticles by filter. The computational simulation shows that the increase in gas temperature and velocity is significantly affected by the increase in CH4 flow rate. The particle trajectory was calculated by using the model, which concerns the effects of thermophoretic force and gas velocity on the particle movement. The particles starting from different initial positions in radial direction will move in different trajectories. As the initial position increases, the particles spend longer time in the gas phase and deposit on the higher position of filter. As the CH4 flow rate increases, the particles move farther from the central axis and it takes a longer time for the particles to deposit on the filter. The particles synthesized at a higher CH4 flow rate show significantly higher temperature history than those particles synthesized at a lower CH4 flow rate.