

209h Numerical Simulation of Heat Transfer in a Rotary Kiln

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Slow granular flows play an important role in industries ranging from food to pharmaceuticals to ceramics, and have been an area of active research in recent years. In contrast, heat transfer in flowing particulate systems has received relatively little attention. In this work, we employ a computational technique that couples the Discrete Element Methods (DEM), Computational Fluid Dynamics (CFD), and heat transfer calculations to simulate realistic heat transfer in a rotary kiln. Our results suggest a novel transition in heat transfer regime as the conductivity of the particle changes. At low particle conductivities, the heat transfer is dominated by gas-solid conduction; however, at higher particle conductivities solid-solid conduction plays the dominant role. The impact that this transition has on the importance of particle mixing will be the focus of our talk.