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Heat transfer in suspensions of rigid particles[1] LUCA BRANDT, MEHDI NIAZI ARDEKANI, Linne FLOW Centre, KTH, Stockholm, OMID ABOUALI, Shiraz University, Mechanical Engineering Department — We study the heat transfer in laminar Couette flow of suspensions of rigid neutrally buoyant particles by means of numerical simulations. An Immersed Boundary Method is coupled with a VOF approach to simulate the heat transfer in the fluid and solid phase, enabling us to fully resolve the heat diffusion. First, we consider spherical particles and show that the proposed algorithm is able to reproduce the correlations between heat flux across the channel, the particle volume fraction and the heat diffusivity obtained in laboratory experiments and recently proposed in the literature, results valid in the limit of vanishing inertia. We then investigate the role of inertia on the heat transfer and show an increase of the suspension diffusivity at finite particle Reynolds numbers. Finally, we vary the relativity diffusivity of the fluid and solid phase and investigate its effect on the effective heat flux across the channel. The data are analyzed by considering the ensemble averaged energy equation and decomposing the heat flux in 4 different contributions, related to diffusion in the solid and fluid phase, and the correlations between wall-normal velocity and temperature fluctuations. Results for non-spherical particles will be examined before the meeting.

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