Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Nanofluid flow and heat transfer in boundary layers: the influence of the concentration diffusion layer on heat transfer enhancement JOSEPH T C LIU, CINTIA JULIANA BARBOSA DECASTILHO, MARK E. FULLER, AAKASH SANE, School of Engineering, Brown University — The present work uses a perturbation procedure to deduce the small nanoparticle volume concentration conservation equations for momentum, heat and concentration diffusion. Thermal physical variables are obtained from conventional means (mixture and field theories) for alumina-water and gold-water nanofluids. In the case of gold-water nano fluid molecular dynamics results are used to estimate such properties, including transport coefficients. The very thin diffusion layer at large Schmidt numbers is found to have a great impact on the velocity and temperature profiles owing to their dependency on transport properties. This has a profound effect on the conduction surface heat transfer rate enhancement and skin friction suppression for the case of nano fluid concentration withdrawal at the wall, while the diffusional surface heat transfer rate is negligible due to large Schmidt numbers. Possible experimental directed at this interesting phenomenon is suggested.

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Date submitted: 01 Aug 2017 Electronic form version 1.4