Abstract Submitted
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Lattice Boltzmann modeling for energy conversion systems NIKOLAOS PRASIANAKIS, JOHN MANTZARAS, Paul Scherrer Institut — The study of advanced small energy conversion systems, such as fuel cells (SOFCs, PEFCs) and microcombustors, requires the use of lattice Boltzmann models that can handle heat transfer and mixing effects. Heat transfer effects can be efficiently studied on the standard lattices (D2Q9, D3Q27) with the thermal model introduced in Ref. [1]. This model can simulate the compressible Navier-Stokes and Fourier equations for large temperature and density variations [2,3]. For multi-component isothermal flows, the model of Ref.[4] is used to simulate the flow through a porous anode of a SOFC. Simulation results show that by decreasing the characteristic length scale of the simulated geometry, micro flow effects that alter the flow field start to emerge. A model that combines the properties and the novelties of both aforementioned thermal and multi-component models will be outlined. References [1] N.I. Prasianakis, I.V. Karlin, Phys. Rev. E 76, 016702 (2006) [2] N.I. Prasianakis, PhD Thesis No 17739, ETH Zurich (2008) [3] N.I. Prasianakis, I.V. Karlin, J. Mantzaras, K. Boulouchos, Phys. Rev. E 79, 066702 (2009) [4] S. Arcidiacono, I.V. Karlin, J. Mantzaras, C.E. Frouzakis, Phys. Rev. E 76, 046703 (2007)

Nikolaos Prasianakis
Paul Scherrer Institut

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