Abstract Submitted
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Modeling of heat transfer and mixing processes for complex geometries with applications to energy conversion systems[1] NIKOLAOS PRASIANAKIS, JINFEN KANG, FELIX BUECHI, JOHN MANTZARAS, Paul Scherrer Institut, Switzerland — The study of advanced small energy conversion systems, such as fuel cells (SOFCs, PEFCs) and microcombustors, requires lattice Boltzmann models that can handle heat transfer and multicomponent species mixing. A new model is developed. The new thermal equilibrium populations are derived following the procedure described in Refs [1,2]. The collision step is split in two BGK-type relaxation processes as described in Ref. [3]. The resulting model has the capability of variable Prandtl and Schmidt numbers. The simplicity of the model allows its implementation to complex geometry flows. For an accurate prediction of the micro flow effects, the diffusive boundary condition is used. Micro-flow simulations of the flow through a SOFC are presented. Preliminary results of flows through three-dimensional complex geometries typically found in PEFCs are shown.

[1] N.I. Prasianakis, I.V. Karlin, PRE 76, 016702 (2007).
[2] N.I. Prasianakis, I.V. Karlin, J. Mantzaras, K. Boulouchos, PRE 79, 066702 (2009).
[3] S. Arcidiacono, I.V. Karlin, J. Mantzaras, C.E. Frouzakis, PRE 76, 046703 (2007).

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