Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Simulation of the flow and heat exchange in a cylindrical solar chemical reactor MANUEL RAMÍREZ-CABRERA, EDUARDO RAMOS, CIE-UNAM — In this work, we present the simulation of the flow inside a cylindrical container filled with an optically participating medium. The motion is generated by the combined effect of the forced convection due to an axial pressure gradient and a natural convective flow induced by a beam of heat radiation that enters into the container though a transparent window located on one of the plane surfaces. The bouyancy force is considered perpendicular to the cylinder axis. The simulation is based on the simultaneous solution of the mass, momentum and energy conservation equations, coupled with the radiation intensity transfer equation. The flow patterns and temperature distributions as functions of the pressure gradient are described to identify the parameters required to maximize the heat absorbed and to obtain a specific temperature field for potential applications. The physical conditions considered are similar to those found in a cylindrical Solar-driven water-splitting thermochemical reactor and it is expected that the results will be useful to determine optimum design parameters.

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Date submitted: 09 Aug 2012 Electronic form version 1.4