

Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Natural convection in a square cavity with participating medium

MANUEL ALEJANDRO RAMÍREZ CABRERA, EDUARDO RAMOS, CIE-UNAM — The natural convective flow in a two dimensional square cavity filled with a material which has properties of an optical participating medium is theoretically analyzed. Radiant energy coming from an external heat source is assumed to fall on a small region of one of the lateral walls of the cavity, and as the working fluid is assumed to be participating, the incoming energy is absorbed in its volume, heating the material by conduction, convection and radiation. The simultaneous presence of temperature gradients and a body force generates a convective motion. We present a mathematical model for describing this phenomenon which includes the conservation equations of mass, momentum and energy. The integral term that describes the radiation heat transport is included in the energy conservation equation. The solution is obtained with a numerical method and representative cases are described. This study has potential applications in the design of heat exchangers in central solar towers.

Manuel Alejandro Ramírez Cabrera
CIE-UNAM

Date submitted: 10 Aug 2010

Electronic form version 1.4