

**COMBINED HEAT TRANSFER IN A DIRECTLY IRRADIATED OPTICALLY-LARGE
HETEROGENEOUS SPHERICAL PARTICLE**

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ABSTRACT. The effects of intra-particle radiative heat transfer on the temperature profiles of a porous particle undergoing heating and cooling processes are investigated. Two particle compositions with differing porosity and optical properties are considered. Two processes are considered for each particle composition: heating under direct concentrated solar irradiation and passive cooling. A novel formulation of the boundary condition for a directly irradiated participating medium surrounded by a non-participating medium is presented for the P_1 approximation. Transient temperature profiles from simulations utilizing the P_1 approximation and the presented boundary condition are compared to profiles from simulations utilizing the Rosseland diffusion approximation for all cases considered.