THERMAL RADIATION REVISITED IN THE NEAR FIELD

Jean-Jacques Greffet[1], P.O.Chapuis[1], R. Carminati[1], M. Laroche[1], F. Marquier[1], S. Volz[1] and C. Henkel[2]

[1] Laboratoire d'Energétique Moléculaire et Macroscopique, Combustion;
Ecole Centrale Paris, Centre National de la Recherche Scientifique
92295 Châtenay-Malabry Cedex, France

[2] Institut für Physik, Universität Potsdam, Am Neuen Palais 10, 14469 Potsdam, Germany

ABSTRACT. Thermal radiation is the radiation emitted by a body at temperature T. Radiative heat transfer between two bodies is described by emission and absorption of photons. If one studies the electromagnetic field in the close vicinity of a surface, the usual theory for radiative heat transfer breaks down. It does not allow to explain the large density of radiative energy within nanometers of the interface. It does not explain the enhancement of the flux between two particles or two interfaces separated by a few nanometers. The purpose of this paper is to give a short review of radiative heat transfer at nanoscale and to serve as a guide in the litterature. The first part of the paper is devoted to the description of the energy density close to an interface. The second part of the paper describes the possibility of producing so-called coherent thermal sources which are surfaces that emit radiation in a very well-defined direction. The third part of the paper adresses the radiative heat transfer at nanometer scale.