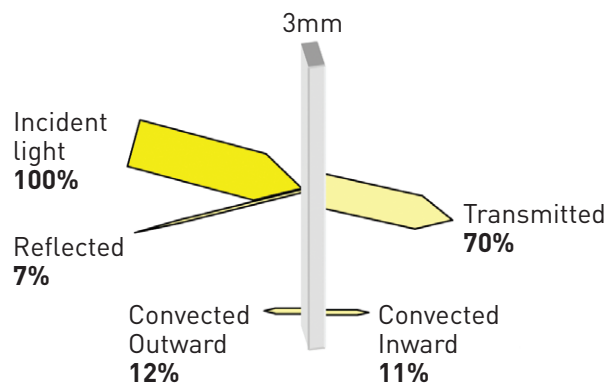


Gold as a nanoscale heater

Exploiting the selective absorption of light by gold nanoparticles

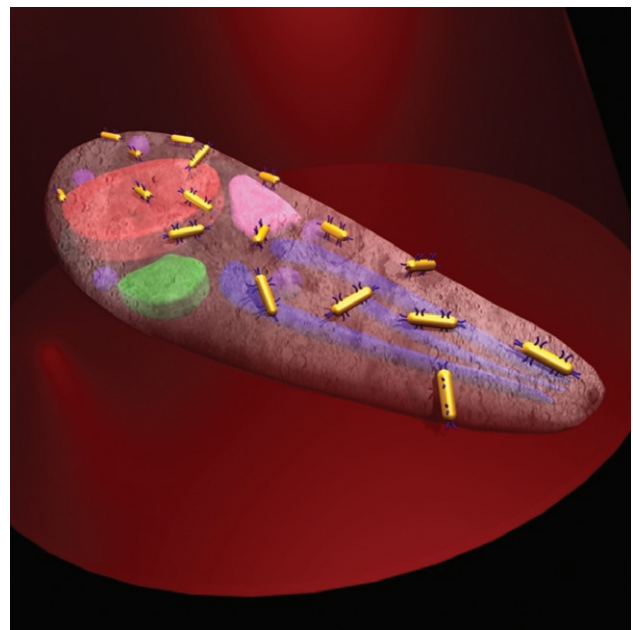
Research at the Institute for Nanoscale Technology at the University of Technology in Sydney (UTS), Australia, has focussed on exploiting the localised generation of heat that results from the selective absorption of light by gold nanoparticles. With appropriate manipulation, a gold nanoparticle can serve either as the basis of a spectrally selective coating or as a nanoscale heater in a biological system. The physics in either case is the same, but the desired result is different.



3mm glass coated with gold nano-particles

The operation of a glass window coated with one of UTS's experimental coatings. In this case the coating blocked 22% of the heat of the radiation source (image from the Masters Thesis of Mr Humayer Chowdhury, University of Technology Sydney)

The position of maximum absorption of an isolated spherical nanoparticle is 518 nm, but may be significantly red-shifted by decreasing the symmetry to a 'nanorod', or by producing a metal 'nanoshell' on a dielectric core, or by aggregating insulated spherical particles, to mention only some of the techniques. Absorbed energy is released as heat in the particles and will cause a temperature rise, the magnitude of which depends upon the value of the effective heat transfer coefficient of the system. Highly localized temperature rises of some tens of Celsius are readily achievable.



Schematic illustration of the "golden bullet" paradigm of medical therapy in which an antibody-conjugated gold nanorod is targeted to an invasive organism (here the parasite *Toxoplasma gondii*) and then used together with a laser to generate a nanoscale heat source that destroys the target (image courtesy of Dakrong Pissuwan, PhD student at University of Technology Sydney)

Excellent control of the manipulation of these gold nanoparticles has now been achieved at UTS and companies interested in the potential commercial application of this technology are invited to contact:

Prof. Michael Cortie
Director : Institute for Nanoscale Technology
University of Technology Sydney
PO Box 123
Broadway NSW 2007
Australia

email: michael.cortie@uts.edu.au

