QED: The Fourth Mode of Heat Transfer?

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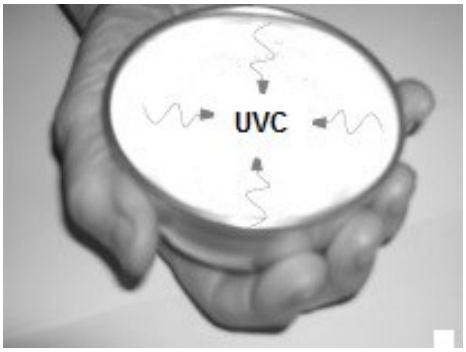
Abstract

Purpose: Heat transfer proceeds by three modes: conduction, radiation, and convection. Conduction and radiation depend on the thermal properties of the material. Convection differs in that heat transfer depends on the properties of the fluid adjacent the material surface. However, heat transfer may also proceed by a fourth mode. Like convection altering the surface of the material, the fourth mode of heat transfer requires coating the surface of the material with a nanoscale layer of a material having a higher refractive index. Unlike conduction, radiation, and convection that find basis in classical physics, the fourth mode is based on QM with the heat transferred to the surroundings by EM radiation. QM stands for quantum mechanics and EM for electromagnetic. Classical physics that requires the atom to always have heat capacity does not predict any heat transfer enhancement for nanoscale coatings. But QM by requiring the heat capacity of the atom in nanoscale coatings to vanish precludes the conservation of EM energy by the usual increase in temperature. Instead, the heat into the coating under EM confinement is induced by QED to create non-thermal EM radiation that produces excitons (holon and electron pairs) that upon recombination ionize and charge the coating or emit the EM radiation to the surroundings. QED stands for quantum electrodynamics. QED heat transfer is illustrated the disinfection of Ebola and drinking water in the developing world using hand-held nan-coated aluminum bowls that by QED convert body heat to UVC radiation. No electricity is needed. In the UVC, QED is 100% efficient surpassing the 1-2 % efficiency of LEDs.

Experimental description: QED induced disinfection of drinking water with UVC radiation from body heat in the hand is illustrated in with a nano-coated bowl; turning the bowl over, disinfects surfaces of the Ebola virus.



The QED radiation wavelength λ depends on the coating thickness d and refractive index n, i.e., λ = 2nd. For example, a bowl comprising a thin-walled aluminum half-sphere fitting in the grip of one hand is provided on the inside surface with a 53 nm zinc-oxide coating having n = 2.4 to produce UVC at 254 nm. Humans produce body heat of about 6 mW/cm^2. Since the UVC intensity necessary to disinfect the Ebola virus is 0.4 mJ/cm^2, the Ebola protocol is to move the hand-held bowl over surfaces in < 1 second scans. For water disinfection, the required 16-38 mJ/cm^2 of UVC means waiting at least 7 seconds before drinking.

Results: The QED disinfection of Ebola and drinking water by body heat is a massive undertaking and requires time for prototype development and testing. Collaboration and funding is therefore solicited. Results to date are encouraging, but details cannot be reported on at this time. Progress is updated at http://www.nanoqed.org

Conclusions: QED induced UV-C radiation from inexpensive hand-held zinc-oxide nano-coated aluminum bowls allows *people* in the developing world to disinfect the Ebola virus and drinking water *themselves* using their own body heat. Costs of the bowls are minimal and may be distributed freely by governments to their people.

Key Words: nanocoatings, heat transfer, UVC disinfection, Ebola, drinking water

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