

PHOTOCATALYTIC DISINFECTION OF WATER AND SURFACES

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Heterogeneous photocatalysis has been reported to be effective for the inactivation of a wide range of microorganisms including bacteria, viruses and protozoa. There are a number of applications possible, including the disinfection of drinking water and the decontamination of surfaces within food and health care environments. Contaminated drinking water is a major cause of disease in developing regions. Diarrheal disease kills approximately 1.8 million people each year and accounts for nearly one fifth of the deaths of children under 5 years old. Solar Disinfection (SODIS) is a simple technique where transparent bottles are filled with contaminated water and placed in direct sunlight for around 6 hours. The combination of solar UV, visible light and heat results in the inactivation of pathogenic microorganisms in the water. SODIS can be effective against the pathogens responsible for cholera, dysentery, typhoid, salmonella, gastroenteritis, cryptosporidiosis, giardiasis and polio. However, some pathogenic microorganisms will exhibit a higher resistance to SODIS treatment. With the aim of improving the efficiency of SODIS, 1.5 m borosilicate glass tubes were coated with titanium dioxide (P25) for testing in SODIS reactors with compound parabolic concentrators (CPC). A range of different configurations were tested under real sun conditions at the Plataforma Solar de Almeria, Spain. Using *E.coli* as the model organism, it was shown that solar photocatalytic disinfection was more efficient than SODIS alone under re-circulating batch conditions.

Super bugs such as methicillin resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* (*C. diff*) are a major problem within the Healthcare sector. These Healthcare Associated Infections (HAI's) can be spread via contaminated surfaces and medical devices where cleaning and disinfection procedures are ineffective. TiO₂ photocatalysis was shown to be effective for the inactivation of clinically relevant pathogens, including MRSA, *C. difficile* spores, multi antibiotic resistant (ESBL) *E. coli*, and *Staphylococcus epidermidis* biofilms. More recently, visible light active photocatalytic materials have been found to be effective for the disinfection of surfaces under illumination by conventional indoor sources.