# Solar Water Disinfection and the Advanced Oxidation Process: Design of a Sustainable Water Treatment Process

Peng, Helen (School: Mississippi School for Mathematics and Science)
Zheng, Reggie (School: Mississippi School for Mathematics and Science)

Solar Water Disinfection (SODIS) is a practical and inexpensive method for disinfecting water and that, traditionally, requires Polyethylene terephthalate (PET) plastic bottles and sunlight. The Advanced Oxidation Process (AOP) can be implemented with the photo-catalyst Titanium Dioxide in SODIS for increased disinfection. SODIS-AOP with the addition of photo-reflectors was improved for usage in emergency situations, via the usage of readily available resources such as plastic water bottles. Mechanisms investigated in previous research were used to design a sustainable water treatment system. The physics of photo-reflectors, application of Titanium Dioxide, and shape of the overall design were investigated and improved through Computer-Aided Deign programs, lab-based experiments, and field tests. Using the calculated surface area of a Titanium Dioxide coating as well as the fundamentals of Fermat's principle for non-focused reflectors in Computer Aided Design Programs, an efficient and effective SODIS-AOP method was designed for more sustainable use in potable water disinfection. Overall, severe microbial deactivation was achieved through a design that maximized the surface area of photo-catalytic disinfection, but further research much to conducted to assess actual effectiveness within a real-life situation and thorough water treatment process.

**Awards Won:**