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Biosynthesis and application of nanostructured composites for purification of drinking water

Emilly Obuya[1] and **Naumih Noah**[2]
[1]Russell Sage College, USA
[2]United States International University, Kenya

Water pollution by microbial contamination that emanates from poor sanitation affects over 50% of the global population, particularly in developing countries. Solar disinfection (SODIS) technique has emerged within the past decade as a simple and low-cost point-of-use water treatment technology. For bacterial inactivation, contaminated water is placed in plastic bottles and exposed to direct sunlight for 6 - 48 hours. The limited quantity of water treated (2L-bottles) and long illumination duration makes the process cumbersome hence hampers large-scale adoption. Additionally, due to the UV process of bacterial deactivation, the SODIS technique is incapable of removing chemical contaminants from the drinking water thus limiting its widespread use for efficient water treatment. In this work, we have applied the green chemistry principles and nanotechnology to design, synthesize, and develop a Ag-TiO2 heterogeneous catalyst that will be used as an additive to improve the overall efficiency of the SODIS technique. The silver nanoparticles (Ag NPs) were biosynthesized from the rind extract of the watermelon fruit and loaded on the surface of titanium dioxide nanofibers (TiO2 NFs) through a wet synthesis method. The surface and electronic properties of the nanocomposite material will be optimized to control the size of the Ag NPs on the TiO2 surface. The Disk Diffusion method will be used as a quantitative antimicrobial assay of the as-synthesized catalysts followed by the Time-Kill method where photoinactivation studies of the catalysts will be tested for their microbial activity against lab-cultured E.coli. We will report the biosynthesis and characterization of silver nanomaterials and results from the Disk Diffusion & Time Kill Methods.

obuyae@sage.edu