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The Advanced Nanoscience Laboratory has been part of the Freshman Research Initiative (FRI) and provided the students with the opportunity to conduct research on projects that are relevant to today's rapidly changing biomedical technologies. The students conducted research to determine biocidal properties of titanium dioxide (TiO₂) and silver nanoparticles. The students were involved in characterizing the nanoparticles by XRD, SEM, EDX, growing E.coli K12 stain on agar plates and testing the nanoparticles' biocidal properties on the E.coli. The measurements were performed to investigate how effective different concentrations of nanoparticles were against the bacteria. Figure 1 shows the biocidal effect of silver nanoparticles on agar plates with E.coli K12. Figure 2 shows the controlled environment setup where the thermite combustion takes place and the nanoparticles are deposited on the agar plates.

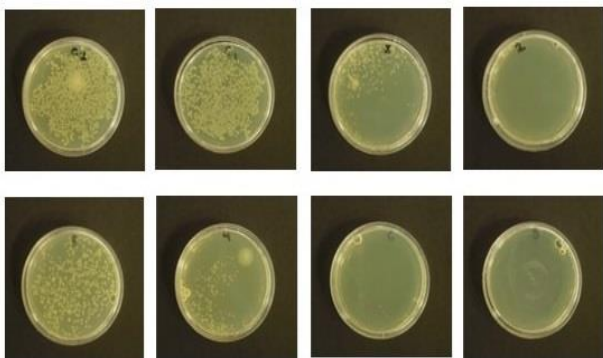


Figure 1. E.coli agar plates (Top row, from left to right: Control 1, Control 2, Position 1, Position 2 and Bottom row, from left to right: Position 3, Position 4, Position 6, Position 5)

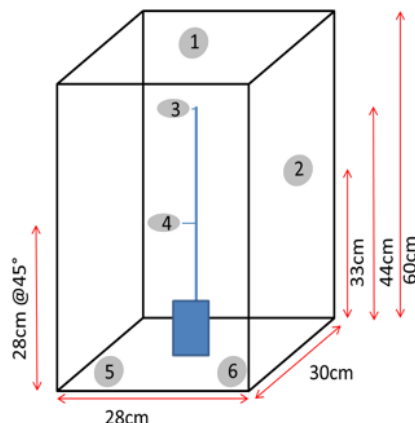


Figure 2. Controlled environment for combustion

The experiment below shows how UV activated TiO₂ nanoparticles were characterized. Figure 3 shows an example of an image of glass microspheres with TiO₂ taken with a Scanning Electron Microscope (SEM). The glass microspheres are used as an insulator and the TiO₂ are used as a UV activated component that is the antimicrobial. The characterization of the nanoparticle was also done using XRD, an example can be seen in Figure 4. There are various applications for the study of antimicrobial nanoparticles with a wide range of benefits that can be used in everyday products such as toothpaste, sunscreen and shampoo.

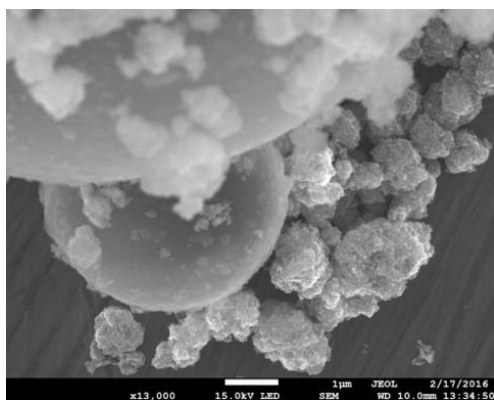


Figure 3. TiO₂ with glass microspheres SEM image

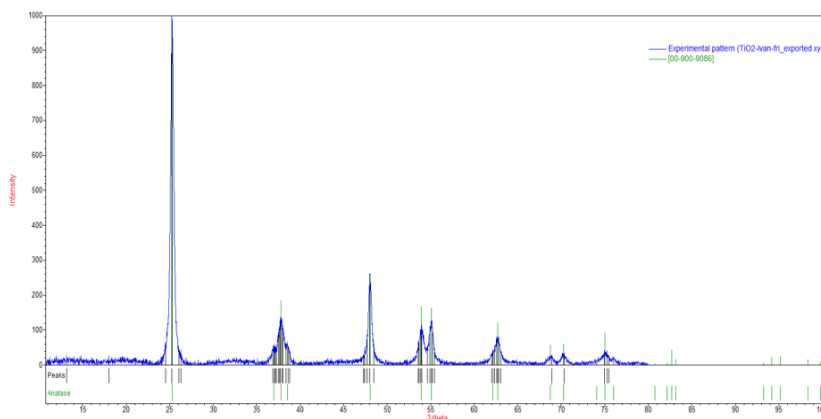


Figure 4. XRD characterization of TiO₂.