

Superhydrophobicity of Biocompatible Titanium Dioxide Nanotubes

Shah, Hetvi (School: Little Rock Central High School)

Infections occur when water touches an incision, such as a wound, due to the harmful bacteria that can begin to grow. 6.5 million patients in the U.S. have been affected by this. Ultimately, these infections could produce a synergistic effect, which could create a bigger problem. To work towards this, a superhydrophobic surface could be created to resist water. Therefore, this research tailored biocompatible titanium dioxide (TiO₂) nanotubes to repel water. Properties of superhydrophobic surfaces include high roughness and low surface energy. The surface wettability refers to the ability of a liquid to sustain contact with a solid surface and can be measured using the water contact angle; if the angle is greater than 150°, then the surface is said to be superhydrophobic. This research hypothesized that if the surface energy is reduced, then the contact angle will increase. To make the TiO₂ nanotubes, titanium was cleaned and anodized. Then, using pulse laser deposition, different amounts of pulsed laser beams were shot onto a target of Teflon, which got deposited onto a sample of TiO₂ nanotubes. Because of the properties it offers, this reduced the surface energy. The water contact angle was measured and recorded for five different samples. In conclusion, as the amount of shots increased, the contact angle increased. A superhydrophobic surface was created on the sample with 40,000 shots and an average contact angle of 151.7°. Upon further investigation, the biocompatible TiO₂ nanotubes could be used in the creation of a new instrument given these promising results.