Surface Modification of Medical Grade Biomaterials by Using Low-Temperature -Processed Dual Functional Ag-TiO_2 coating for preventing Biofilm Formation

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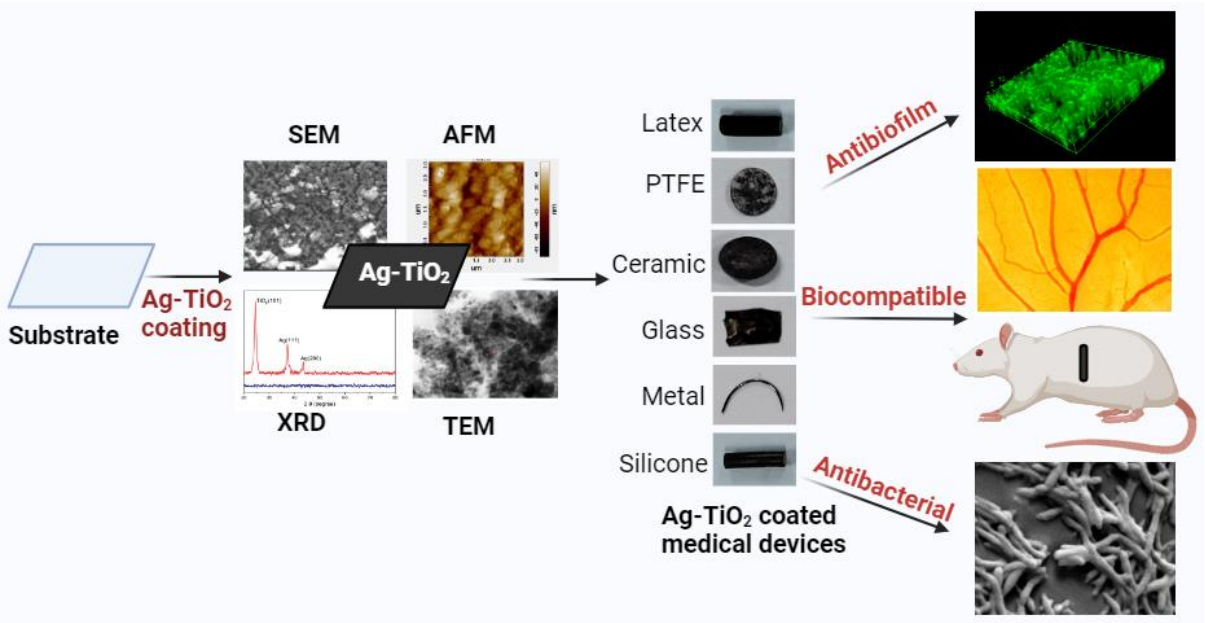
Abstract:

Many healthcare centers heavily depend on modern technologies, including medical devices, for both diagnosis and treatment. These devices are manufactured using a wide range of materials such as silicone, ceramic, glass, polymers, metals, composites, etc, which proves to be an ideal environment for the growth and development of biofilm. Biofilm development is considered the major virulence component that leads to increased mortality and morbidity among patients receiving medical treatments. To address the issue of bacterial attachment in medical devices, we propose a novel antibacterial surface modification approach. In this paper, we developed a novel low-temperature based solution-processed approach to deposit silver nanoparticles (AgNPs) inside a titanium oxide (TiO_2) matrix to obtain Ag-TiO_2 nanoparticles coating. Different types of medical-grade biomaterials were then coated using Ag-TiO_2 NPs to modify the surface of the materials. Both silver (Ag) and titanium (TiO_2) have antimicrobial properties and serve as a dual protective layer that mitigates microbial infections. Several studies were performed to observe the antibacterial and antibiofilm properties of Ag-TiO_2 coated medical devices and biomaterials. This study shows that Ag-TiO_2 coating has a promising potential for use in healthcare applications in combating microbial infection and biofilm formation.



Graphical abstract. Schematic illustration showing characterization and surface coating of Ag-TiO2 thin film over medical devices shows antibacterial and antibiofilm properties.