

## Dual-Functional Textile Surfaces for the control of microbial contamination

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The development of antimicrobial textile is of growing interest, particularly for applications in the medical field. Biological contamination, such as bacterial growth on surfaces, can be effectively controlled by applying finishing treatments that either kill microorganisms (antimicrobial activity) or make the surface repel water (hydrophobic properties), thus inhibiting bacterial adhesion. Silver nanoparticles are well known for their broad-spectrum antimicrobial efficacy, particularly against *Escherichia coli* and *Staphylococcus aureus*. Titanium dioxide, on the other hand, exhibits strong affinity for natural textiles such as cotton, acting as a cross-linking agent to facilitate the transfer of hydrophobic molecules with intrinsic antibacterial properties, such as lipopeptides. In this study, cotton and polyester fabrics were functionalized with silver–hydroxyethyl cellulose and titanium–lipopeptide nanophases, following a preliminary treatment with commercial resins to improve hydrophobicity. Fabrics were coated by dip-padding and cured up to 100°C to preserve resins and nanoparticle integrity. Antimicrobial activity was evaluated according to ASTM E2149-01 under dynamic contact conditions, showing complete bacterial reduction in Ag-based samples with resin. Hydrophobicity tests indicated that Ti-based coatings improve hydrophobicity depending on the fabric type and resin used. The combination of nanophase deposition and resin treatment proved effective in producing textiles with dual protective functions. These hybrid coatings hold promise for future use in hygienic and medical textile applications.