Enzymatic Anti-Biofilm Surfaces

Turn passive surfaces into self-defending barriers – without leaching biocides or fueling resistance. acib's immobilized enzymes activate exactly where microbes attach: generating on-contact microbicidal action and dismantling biofilm matrices to keep devices cleaner, longer. A durable, biocompatible route to next-gen coatings for catheters, endoscopes, membranes, sensors, and more.

BACKGROUND

Biofilms on devices drive hard-to-treat infections by shielding microbes from antibiotics and immunity. Release-based coatings (e.g., antibiotics, silver) often rely on finite drug elution, raising concerns about depletion, leaching and the potential for resistance. Cationic polymers can lose efficacy once dead-cell layers accumulate. Anti-adhesive coatings delay initial fouling, but face challenges achieving dense, long-lasting grafts. Liquid-infused designs repel contaminants initially, yet lubricant loss and mechanical wear limit long-term stability. Photodynamic coatings can be potent, but require sufficient illumination and oxygen.

TECHNOLOGY

We engineer enzyme-functionalized surfaces for virtually any substrate and use case – medical devices, food-contact and packaging, membranes and sensors, textiles and films, process equipment and high-touch surfaces. Our modular design combines matrix-degrading enzymes to disperse biofilms, lytic enzymes to eliminate target organisms, and oxidoreductases that generate microbicidal H_2O_2 directly at the interface. We have e.g. demonstrated covalent grafting of cellobiose dehydrogenase (CDH) onto plasma-activated silicone (PDMS) with 60% fewer viable *S. aureus* after 3 h, ~70% less biofilm after 7 days, and 20% retained activity after 16 days in artificial urine, with no mammalian cell toxicity – evidence for durable, non-leaching performance. We also developed an ultrasound one-step deposition of active CDH nanoparticles that produce micromolar H_2O_2 and significantly reduce surface colonization, supporting scalable coating on polymers and other materials. Because CDH accepts a broad range of oligosaccharides – including components of bacterial exopolysaccharides – the system can self-activate where microbes adhere. Together with established immobilization chemistries (covalent grafting, layer-by-layer, entrapment/adsorption), this enables tailored integration across metals, polymers, glass, ceramics, and textiles.

OFFER

Proven enzyme and biofilm expertise with successful data on enzyme-grafted catheters, plus access to state-of-the-art immobilization and microbiology workflows. Our designs align with current trends toward bacteria-triggered, multifunctional antibiofilm materials – bridging academic insight and deployable industry solutions. Project IP can be fully transferred to the company partner; we are happy to discuss details under NDA and provide a tailored proposal with milestones and timelines for medical devices, industrial and consumer surfaces alike.

EXPERTS

Prof. Dr. Georg Gübitz

DEVELOPMENT STATUS:

Technology Readiness Level 4
(Technology Validated in Lab)

KEYWORDS

- Antibiofilm Surfaces
- Enzymatic Coatings
- Antimicrobial Enzymes
- Surface Functionalization
- Biofilm Control
- Lytic Enzymes
- Oxidoreductases
- H_2O_2 Generation
- Medical Devices
- Membranes & Sensors
- Food-Contact/Packaging

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