Nanomaterial-based surfaces - promising alternatives to antimicrobial applications

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The highest level of microbial transmission occurs via frequently touched surfaces. Thus, fast elimination of contagious microbes from surfaces, e.g., by antimicrobially active surfaces is a key to combat the spread of infections. Scientific literature on antimicrobial surfaces has emerged since 1960s with copper was the first widely used active agent. Recently, a variety of formulations have been introduced to antimicrobial surface coatings in nanoparticulate form, to increase the active surface area and thus, antimicrobial efficacy.

In our group we have been developing nanomaterial-based light-activated surface coatings over several years (1-3). Such surface coatings are based on ZnO/Ag nanocomposites that compared with pure ZnO nanoparticles possess higher photocatalytic activity and thus, also elevated antimicrobial activity.

We have demonstrated the antibacterial efficacy of ZnO/Ag nanocomposite-based surfaces both, after direct spray-coating of the nanocomposites to surfaces as well as after their embedding to a polymer matrix. Depending on the test conditions, ≥99% reduction of bacterial counts on nanocomposite-containing surfaces has been achieved after 15-60 min. We have shown long-term stability and efficacy of the surfaces. Parallel cytotoxicity studies have indicated that the surfaces are safe for human use.

This work is expected to result in robust and effective photocatalytic surface coatings for external high-touch surfaces while also providing a framework for real-life relevant efficacy testing of antimicrobial surfaces in the future.

References

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