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Antimicrobial electrospun silver-, copper- and zinc-doped polyvinylpyrrolidone nanofibers

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Highlights

> Electrospun polyvinylpyrrolidone (PVP) nanofibers containing silver, copper and zinc
> Antimicrobial effect for the bacteria *Staphylococcus aureus* and *Escherichia coli*
> Silver strongly reduced colony forming units and bacterial viability
> Silver, copper and zinc led to a significant increase of non-viable cells on mats

Abstract

The use of electrospun polyvinylpyrrolidone (PVP) nanofibers containing silver, copper and zinc nanoparticles was studied to prepare antimicrobial mats using silver and copper nitrates and zinc acetate as precursors. Silver became reduced during electrospinning and formed nanoparticles of several tens of nanometers. Silver nanoparticles and the insoluble forms of copper and zinc were dispersed using low molecular weight PVP as capping agent. High molecular weight PVP formed uniform fibers with a narrow distribution of diameters around 500 nm. The fibers were converted into an insoluble network using ultraviolet irradiation crosslinking. The efficiency of metal-loaded mats against the bacteria *Escherichia coli* and *Staphylococcus aureus* was tested for different metal loadings by measuring the inhibition of colony forming units and the staining with fluorescent probes for metabolic viability and compromised membranes. The assays included the culture in contact with mats and the direct staining of surface