

FABRICATION AND TESTING OF ANTIMICROBIAL EFFICACY OF POLY(VINYL)ALCOHOL/COPPER (PVA/Cu) NANOFIBRES

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ABSTRACT

Nanosized poly(vinyl alcohol)/Cu (PVA/Cu) fibre mats were fabricated using the electrospinning technique. This was achieved by mixing PVA (10% w/v) and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (5-15% w/v) in water at room temperature with continuous stirring until the salt was completely dissolved. This polymeric solution was then electrospun at 20kV (voltage), 20cm (tip-collector distance) and 0.15ml/sec (flowrate) yielding fibres ranging between $100\text{-}380 \pm 10$ nm. Fourier Transform Infra-Red (FT-IR) and Electron Dispersive (EDX) spectroscopy were used to confirm the presence of the copper ions on the fibres. Thermogravimetric analysis (TGA) and Differential Scanning Calorimetry indicated that the modification of PVA fibres into PVA/Cu did not affect the stability of the fibres when exposed to high temperatures. These fibre mats were then tested for their antimicrobial capabilities and both bioluminescence *in vivo* imaging and plate counting techniques used confirmed a reduction of up to 7 logs on *Staphylococcus aureus*, *Salmonella typhimurium*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* bacteria. Leaching experiments over periods of 24, 12, 6 and 1 hour all showed less than 1% leaching of Cu^{2+} ions.

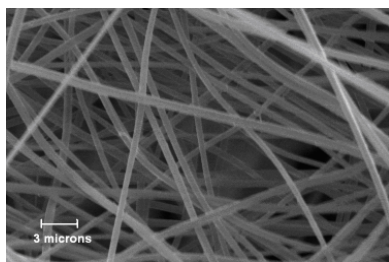


Figure 1: PVA/Cu nanofibres before filtration

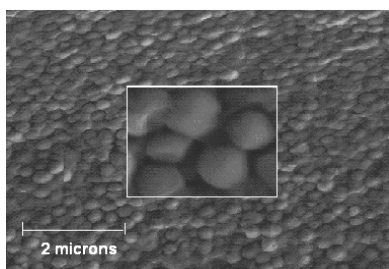


Figure 2: Nanofibre membrane with lysed *Staphylococcus aureus* cells

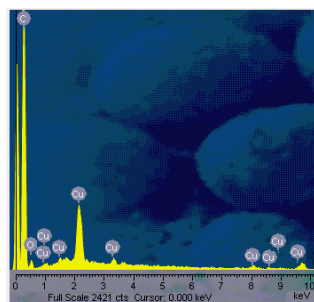


Figure 3: EDX spectrum of PVA/Cu nanofibres