

## **Preparation of Antimicrobial Silk Fibers by Use of Metal-containing Dyestuffs**

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The authors presented a new technique for preparing silk fibers with persistent antimicrobial activity through use of metallic dyestuffs during the fiber dyeing process. The length of the silk fibers investigated contracted when the fibers were immersed in concentrated neutral salt solutions such as calcium or potassium nitrate at elevated temperature levels. The birefringence and molecular orientation of the silk fibroin molecules became less ordered by the action of the neutral salt solutions, resulting in increased dyestuff absorption. Subsequently, contracted silk fibers were dyed with metallic dyestuffs containing Cr or Cu for the purpose of obtaining silk fibers with antimicrobial activity. Silk fibers dyed with metallic dyestuffs showed significant antimicrobial activity against the plant pathogen, *Cornebacterium*, as well as the human pathogen *Coli bacillus*. Tensile strength of the silk fibers after the salt shrinking and dyeing processes did not show a significant change, while the elongation at break was increased slightly. The techniques described here for preparing significantly active antimicrobial silk fibers are effective and economic ways of providing new materials for industrial and biomedical application.