

Antimicrobial Hydrogel with Controlled Silver Nanoparticle Release

Technology Domain: Nanotechnology

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Status (Patent/TRL): Patent Pending / TRL 3

Technology Summary:

This invention introduces a novel antimicrobial hydrogel for medical and industrial applications. The key technical solution involves encapsulating precisely synthesized silver nanoparticles (AgNPs) within a collagen-based hydrogel matrix. The AgNPs are prepared using a controlled method involving silver nitrate, sodium alginate, and citric acid, with optimized pH and heating, ensuring uniform, stable (5-10 nm, spherical) nanoparticles. The key inventive feature lies in this unique combination and synthesis, which provides controlled release of AgNPs and leverages the collagen for tissue repair and cellular migration. This approach overcomes limitations of prior art, avoiding cytotoxicity, environmental concerns, and stability issues associated with silver salts or other methods.

Results demonstrate superior antimicrobial activity against *Staphylococcus aureus* and *Candida albicans* compared to commercial antibiotics, along with sustained release over seven days in simulated body fluids. The use of this cost-effective and biocompatible hydrogel is for enhanced wound healing, infection prevention, and various personal care and industrial applications.

