

# NanoMaterials 2025: Bridging Material Science, Polymers and Chemical Engineering

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## Bio-Nanowound Dressing: A Natural Breakthrough for Burns and Chronic Wounds

Ibrahim Alghoraibi

Associate Professor, Faculty of Pharmacy, Arab International University (AIU), Syria

### Abstract

This lecture focuses on the production of a 100% natural bio-nanofibrous wound dressing fabricated from natural nanopolymeric fibers with dimensions ranging from 50–100 nm and featuring an ultra-high porosity of 150–200 nm. The dressing is intended for clinical application in the treatment of burns and chronic wounds, accelerating the healing process. In parallel, silver nanoparticles are produced and applied for sterilizing burns and wounds prior to using the dressing. The bio-nanowound dressing exhibits distinctive advantages: it is semi-permeable, allowing the exchange of oxygen and water vapor while simultaneously acting as a natural barrier against bacterial penetration. Moreover, it is easy to use, replaceable, and reusable after sterilization with locally synthesized silver nanoparticles. This innovative dressing can be applied in multiple medical cases, including skin burns, skin graft donor and recipient sites, keloids, diabetic ulcers, perforated foot disease, contaminated surgical wounds, pressure ulcers, injuries following thermal cauterization or cryotherapy, and even in dental applications, such as regenerating odontogenic cells, endodontic treatments, and preventing post-extraction alveolar bone loss. This product represents the first of its kind in Syria, rivaling globally manufactured dressings, while being fully natural, flexible, tear-resistant, user-friendly, and cost effective. It can be manufactured in various sizes tailored to wound or burn dimensions. Importantly, it contributes significantly to improving patients' quality of life by accelerating wound healing and reducing healthcare costs.

### Key properties of the innovative bio-nanodressing include

- Transparent membrane, 100% natural and biocompatible
- Highly porous structure (150–200 nm) with nanofiber dimensions of 50–100 nm
- Available in different sizes and thicknesses according to clinical requirements
- Safe, non-toxic, non-allergenic, painless during application and removal
- Acts as a natural antibacterial barrier, ensuring wound protection

### Major advantages of this innovative dressing

- Easy to apply and remove, with no pain or skin damage
- Suitable for both hospital settings and community use
- Accelerates the healing process, enables exudate management and easy monitoring of wound progress
- Maintains wound site moisture, effectively allowing gas and fluid exchange
- Prevents infection and microbial contamination
- Stimulates new skin tissue growth through direct contact with the wound surface
- Enhances tissue re-epithelialization, thereby accelerating healing
- Low-cost therapeutic option with high efficiency

### Targeted clinical applications include

- Skin burns and abrasions
- Donor and recipient skin graft sites
- Keloids and hypertrophic scars
- Diabetic ulcers and perforated foot wounds
- Contaminated surgical wounds
- Pressure ulcers.
- Thermal cauterization and cryotherapy injuries