

**TECH OFFER**

**Topical Burn Treatment Using TMD Nanosheets with Multi-Functional Therapeutic Effects**



**KEY INFORMATION**

TECHNOLOGY CATEGORY:

Healthcare - Medical Devices

Healthcare - Pharmaceuticals & Therapeutics

Materials - Nano Materials

Personal Care - Cosmetics & Hair

TECHNOLOGY READINESS LEVEL (TRL): **TRL5**

COUNTRY: **SOUTH KOREA**

ID NUMBER: **TO175460**

**OVERVIEW**

While split-thickness autograft (STSG) combined with dermal substitutes remains the conventional procedure for burn wounds, evolving advancement in technologies have provided alternatives and multi-model treatment for deep burns which includes mechanisms such as dermal scaffolds, cellular therapies, anti-microbial dressings and regenerative adjuncts.

This technology introduces a topical burn treatment formulated with Transition Metal Dichalcogenide (TMD), WS<sub>2</sub> (tungsten disulfide) nanosheets as the key active ingredient. TMDs are a class of two-dimensional (2D) layered materials combining tunable electronic, optical, and catalytic properties with excellent mechanical flexibility and chemical stability.

Traditional burn therapies mainly focus on anti-bacterial activity but often delay healing due to strong cytotoxicity. The TMD nanosheet formulation shows powerful anti-oxidant, anti-inflammatory, and anti-bacterial effects simultaneously. It efficiently

scavenges reactive oxygen and nitrogen species (ROS/RNS), suppresses inflammatory cytokines, and reduces cell apoptosis—ultimately minimizing tissue damage and promoting faster wound recovery.

These attributes make TMDs promising for next-generation biomedical materials, particularly in antibacterial coatings, wound dressings, and photothermal therapy—offering multi-functionality beyond traditional metallic or polymeric materials. Laboratory and animal studies have verified its efficacy and safety, suggesting strong potential for clinical translation once large-scale synthesis and formulation optimization are completed.

The technology owner is seeking collaboration partners with:

- Pharmaceutical and skincare companies
- Medical material manufacturers
- Clinical research institutions interested in nanomaterial-based drug delivery systems and topical wound-care products.

## TECHNOLOGY FEATURES & SPECIFICATIONS

The technology patent comprises formulating the pharmaceutical composition for treating burns and adding TMD to a polymer solution.

- The TMD nanosheets are synthesized through a simple, low-cost, and scalable process that yields highly stable, biocompatible nanosheets.
- Demonstrate low cytotoxicity of active oxygen species/nitrogen species even at high concentrations, superior anti-oxidant capacity, and broad-spectrum anti-microbial activity.
- Key mechanisms include reduction of oxidative stress, inhibition of inflammatory mediator release, and enhancement of antimicrobial peptide secretion.
- Form-factor flexibility (can conform to irregular, exudative, or graft-adjacent areas).
- Likely ambient-stable polymer composites.
- Potential to reduce antibiotic use.

## POTENTIAL APPLICATIONS

This technology can be applied in healthcare and dermatological industries, particularly for:

- Burn and wound-healing creams, sprayable/injectable hydrogels, or patches/ films
- Anti-inflammatory and skin-regeneration products
- Chronic wound care for diabetic foot ulcers or other skin disorders

It can also extend to cosmeceutical or dermatology platforms requiring oxidative stress control and anti-aging functions.

## MARKET TRENDS & OPPORTUNITIES

The global burn-care market exceeds USD 2 billion annually and continues to grow due to increasing industrial and household burn injuries.

Because the TMD nanosheet formulation provides broad-spectrum, low-toxicity, and multifunctional benefits, it offers a compelling alternative to existing silver-based or iodine-based treatments, which often cause cytotoxicity or delayed recovery.

## UNIQUE VALUE PROPOSITION

Unlike existing treatments such as silver sulfadiazine (SSD) or povidone-iodine, which mainly target infection control, this technology offers comprehensive tissue protection and regeneration via a single nanomaterial platform.

It combines anti-oxidation, anti-inflammation, anti-bacterial, and anti-apoptotic mechanisms—delivering synergistic healing effects with minimal side effects. It provides an anti-bacterial effect through expression of an anti-bacterial peptide.

Its scalable synthesis, high stability, and strong biocompatibility also make it ideal for cost-effective production and long-term storage.