

Preparation of Antimicrobial, Non-toxic Absorbents for Disposable Sanitary Napkins by Ionotropic Crosslinking of Chitosan IITM Technology Available for Licensing

Problem Statement & Unmet Need

- **Chemical cross-linkers** used to crosslink Chitosan are **toxic**, making them **unusable** for applications.
- As an exception, **Genipin** is naturally extracted and less toxic than other chemicals but very **expensive**.
- Ionotropically crosslinked systems are mechanically unstable and **react to environmental changes** due to high pH-sensitive swelling, creating gel dissolution risk.
- Metal-organic complexation crosslinked Systems have **high cytotoxicity** and are **prone to exchange reactions with other metal ions**.
- Therefore, there is a requirement to overcome the above issues with an improvised solution as discussed in the present invention.

Technology Category/ Market

Bio-Chemical Technology: Medical & Surgical

Industry: Bio-Medical, Environment engineering

Application: Pharmaceutical, Tissue Engineering, Sanitary Napkin Manufacturing

Market: The Indian sanitary napkin market size reached US\$ 688.9 Million in 2022, and said market is projected to reach US\$ **1,227.1** Million by **2028**, exhibiting a growth rate (CAGR) of **9.5%** during 2023-2028.

Technology

- A **rapid** method, for preparing an **absorbent** for disposable sanitary napkins by ionotropic crosslinking of chitosan by **electrostatic interactions**, is described in the following steps:

1

- Dissolving chitosan in a mild acid solution having a pH range of less than 6.5

2

- Adding and dissolving a water-soluble metal precursor in the solution obtained

3

- Adding a precipitating agent while continuously shearing the above-mentioned solution for crosslinking chitosan

- The crosslinked particles are prepared by **drying and grinding** the gel (*in situ*) followed by **freeze-drying** to get a porous network with a high surface area to crosslink chitosan by **electrostatic interactions** between **chitosan polycation** and the **negatively charged colloidal particles**.
- The mild acid solution is selected from an **aqueous solution of acetic acid, hydrochloric acid**, and others; and the water-soluble metal precursor is selected from the **group of water-soluble salts** composed with at least one of **chlorides, nitrates**, and others as claimed.

- To determine the suitability of absorbent **ABSORPTION UNDER LOAD (AUL) TEST** is performed shown in Fig. 1

Images



Figure 1

Intellectual Property

IITM IDF No.: 1689;

IN Patent No.: 417294 (Granted)

Key Features / Value Proposition

❖ **User Perspective:**

The absorbent used in this **bio-degradable** sanitary napkin is extracted from **renewable sources** making it **antimicrobial, anti-fungal, non-toxic bleach-free, cost-effective, irritation-free, & accessible** to all women.

❖ **Technical Perspective:**

The gels absorb water and saline while being **anti-microbial & neutralized under load and low cytotoxicity**. It has a vast potential for use as an absorbent for disposable sanitary napkins.

❖ **Industrial Perspective**

- In biomedical industries, chitosan is an **Active Pharmaceutical Ingredient (API)** for treating **ulcers, chronic periodontitis, etc.**
- The chitosan-based crosslinked systems are **effective absorbents in sanitary napkins**.
- Hydrogels of chitosan store **excess water** & are **used in agriculture** for the sustained release of water.

TRL (Technology Readiness Level)

TRL- 3; The Proof of Concept Stage

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