



METHOD FOR SYNTHESIS OF NANOCOMPOSITES BY MICROBES

IITM Technology Available for Licensing

Problem Statement

- ❑ Bone tissue engineering faces challenges in developing strong, vascularized scaffolds; existing polymer-based substitutes lack bioactivity and struggle to mimic natural bone structure.
- ❑ This invention includes **cost-effective, biomimetic bone substitutes and solutions promoting enhanced bone regeneration** and integration, demanding innovative approaches leveraging **natural materials and microbial processes**.

Technology Category/ Market

Category - Biomedical Engineering, Tissue Engineering

Applications - Bone Tissue Engineering, Medical Implants.

Industry - Biomedical, Materials Science, Healthcare Industry.

Market - Global Bioengineering Technology Market size was valued at USD 239.1 Bn in 2022 and the Bioengineering Technology Market revenue is expected to grow at a **CAGR of 12.3 %** from 2023 to 2029.

Intellectual Property

- IITM IDF Ref. 1731
- IN 402779 (Patent Granted)

TRL (Technology Readiness Level)

TRL- 4, Technology validated in lab scale.

Research Lab

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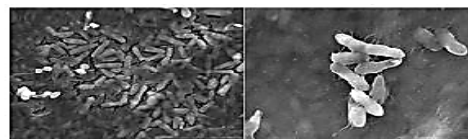
Key Features / Value Proposition

User Perspective:

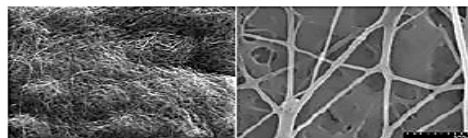
- ❖ Surgeons and patients benefit from innovative nanocomposites during surgeries, improving outcomes and accelerating bone healing.
- ❖ Patients with bone injuries gain faster recovery and better quality of life with biomimetic scaffolds supporting natural bone regeneration.

Technical Perspective:

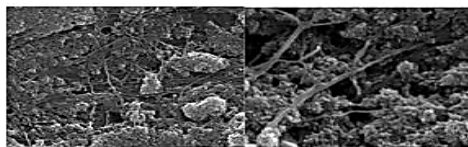
- ❖ Researchers focus on efficient synthesis and characterization of microbial Nano cellulose, ensuring mechanical strength and biocompatibility.
- ❖ Optimization of hydroxyapatite deposition techniques and evaluation of resulting nanocomposites' properties are crucial for bone tissue engineering.



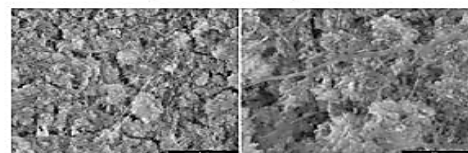
BNC as collected



BNC after alkali wash



SPBNC-HA Nanocomposite



SBBNC-HA Nanocomposite

FIG. 1 shows the process stages for obtaining BNC, SPBNC-HA, and SBBNC-HA nanocomposites

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Technology

Microbial Nano cellulose:

Utilizes microbial synthesis from bio-tea to produce **Symbiotic Colony of Bacteria and Yeast(SCOBY)**, a low-cost source of Nano cellulose.

Bacterial Synthesis:

Employs **Serratia marcescens** to synthesize **carbonated hydroxyapatite** resembling natural bone composition.

Bone Tissue Engineering:

Leverages nanotechnology for strong, porous scaffolds addressing bone defects

Hydroxyapatite Deposition:

Deposition onto Nano cellulose mimics natural bone formation for enhanced biomimetic properties.

Nanocomposite Fabrication:

Integrates Nano cellulose and hydroxyapatite, **aligning rod-shaped crystals** to mimic bone structure.

Image

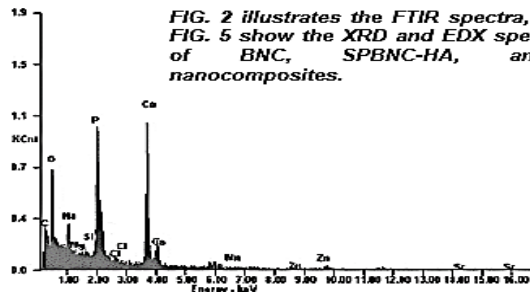
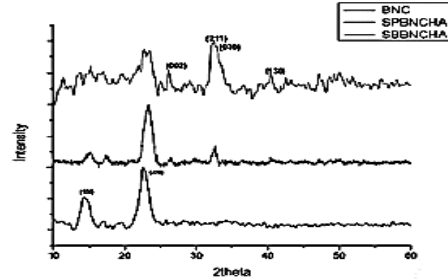
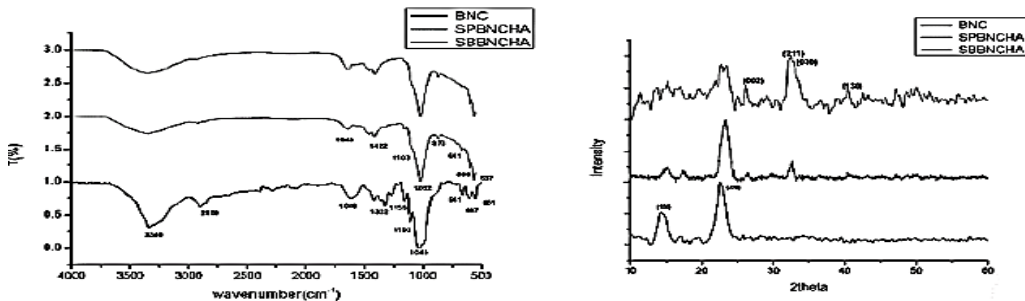


FIG. 2 illustrates the FTIR spectra, while FIG. 3 and FIG. 5 show the XRD and EDX spectra, respectively, of BNC, SPBNCHA, and SBBNCHA nanocomposites.

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