

An Improved Bioceramic Mineral Releasing Bioactive Tetracalcium Phosphate Cements and Method of Producing the same from Egg Shells Waste

IITM Technology Available for Licensing

Problem Statement

- Deep Dental Caries management is a big problem in **dental clinics** as dietary carbohydrates **ferment** by caries leads **pH drop** below **5.5**, causing demineralization of enamel & **potential damage** to underlying tooth structure
- Conventional remedies for oral cavity are **conventional grinding hand pieces, lasers and air-blasting apparatus**, but these remedies are not successful.
- Hence, there is a requirement to address said issues by introducing improved **Bioceramic mineral** using the egg shell waste.

Technology Category/ Market

Material Science

Industry: Pharmaceutical Industry;

Applications: Medicine and bioactive minerals, treatment of **deep caries** in dental applications.

Market: The global market of bioactive materials was around USD 2.0B in 2020; expected to increase at a **CAGR** of **14.0%** during the time period of **2021-2028**.

Technology

Patent disclosure explains an improved **method for producing a bioceramic mineral** releasing bioactive tetracalcium phosphate cements.

- The method comprises the steps of:

Mixing **calcium carbonate** of egg shells waste with dicalcium phosphate anhydrous (DCPA)

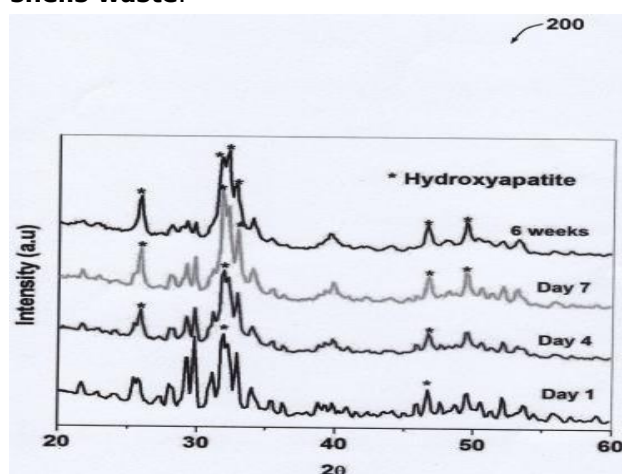
Heating at **1500°C** for **6-12** hours in order to synthesize Tetracalcium phosphate

Mixing synthesized **Tetracalcium Phosphate** with the liquid component of the cement containing **1M disodium hydrogen phosphate (Na₂HPO₄)** containing **10% citric acid** using dental cement spatula in **L/P ratio** of **0.5ml/g**

Packing the mixture in a mold and allowing the mixture to harden for obtaining improved Bioceramic mineral releasing **Bioactive Tetracalcium Phosphate Cements**.

- The said method further induce **secondary dentin formation** due to sustained calcium hydroxide release of the Bioceramic material.
- The **Tetracalcium phosphate cement** is modified by addition of other calcium phosphates having **Ca/P ratio** lower than **2**.

The **FIG 1** illustrates a graphical representation of the **X-ray Diffraction (XRD)** pattern **200** of **Tetracalcium phosphate** derived from the **egg shells waste**.



Intellectual Property

- IITM IDF Number:** 1193
- IP Patent Number:** 419821 (Granted)

Key Features / Value Proposition

- Bioceramic material is used as a **bone reconstructive material** including **bone graft and bone substitute**.
- Bioceramic material releases **calcium hydroxide Ca(OH)₂** over extended periods of **48 days** to maintain mechanical integrity.
- It is used as **multipurpose Bioceramic self-setting cement** for dental caries affected tooth as antibacterial dental cement, enamel and dental remineralization, root canal filler, dental liners and bases, and luting material.
- Hydrolysis** of the Tetracalcium Phosphate to **HA** and **Ca(OH)₂** occurs slowly under physiological conditions due to the release of calcium hydroxide **raising the pH** and the **mechanical strength** of Bioceramic material is not far from **clinical requirements**.

TRL (Technology Readiness Level)

TRL – 3/4; Proof of Concept

Research Lab

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