IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

METHOD FOR FORMATION OF NANOSTRUCTURES ON AZ-31 (Mg ALLOY) AND THEIR USES THEREOF

IITM Technology Available for Licensing

Problem Statement

- Mg alloys are commonly used as implant materials where the mechanical properties of **Mg alloys matches with the natural bone, reducing bone mismatch**
- But the currently used Mg–alloys are **prone to corrosion and undergoes degradation** thereby **retarding the bone healing process**

Technology Category/ Market

Category – Medical & Surgical/Advanced materials
Applications –Medical implants
Industry – Biomedical Engineering
Market -The **global medical implants market size** was valued at USD **90.24 billion in 2022** and is expected to reach **US$ 173.41 billion by 2032**, poised to grow at **a CAGR of 6.8%** during the forecast period 2023 to 2032.

Key Features / Value Proposition

Technical Perspective:

- Novel method to achieve **nanostructures on Mg-alloy (AZ-31)** for potential biomedical applications
- Anodization, along with optimized electrochemical parameters can help **in self-organized growth of nano-orous or nano tubular oxide layers in the material**
- **Surface chemistry can be tailored and pore structure can be controlled**; sample anodized at 40 V shows a porous structure with a diameter of ~60 and 80 nm, and height of the nanostructures is ~150 nm.

User Perspective:

- **Cost-effective**, and can be **fabricated** on the surface of existing medical implants, **mechanically rigid and chemically stable**
- **Ability to control corrosion, and Mg degradation rate, high surface area, exceptional biocompatibility**

Intellectual Property

- **IITM IDF Ref. 1973**
- **IN416705-Granted**

Technology

The present invention discloses a method for forming nanostructures on AZ-31 magnesium alloy comprising:

- Develop an anode material consisting of **AZ-31 magnesium alloy with a composition of Mg-3Al-1Zn(wt.%)**
- **Develop a cathode material** made of platinum to serve as secondary electrode
- **Preparing a hybrid electrolyte** by mixing Ti powder with hydrofluoric acid
- Forming nanostructures on AZ-31 Mg-alloy substrates using the **two-electrode electrochemical anodization cell**

Images

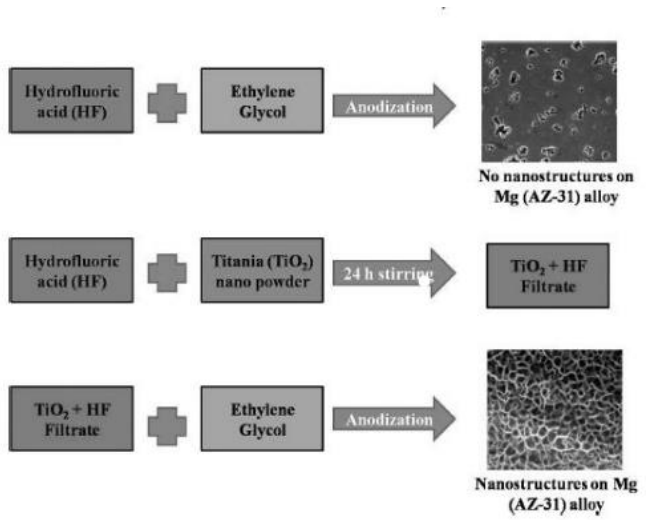

Fig 1. is a representation of the steps for preparing the hybrid electrolyte for anodization of AZ-31 (Mg-Alloy)

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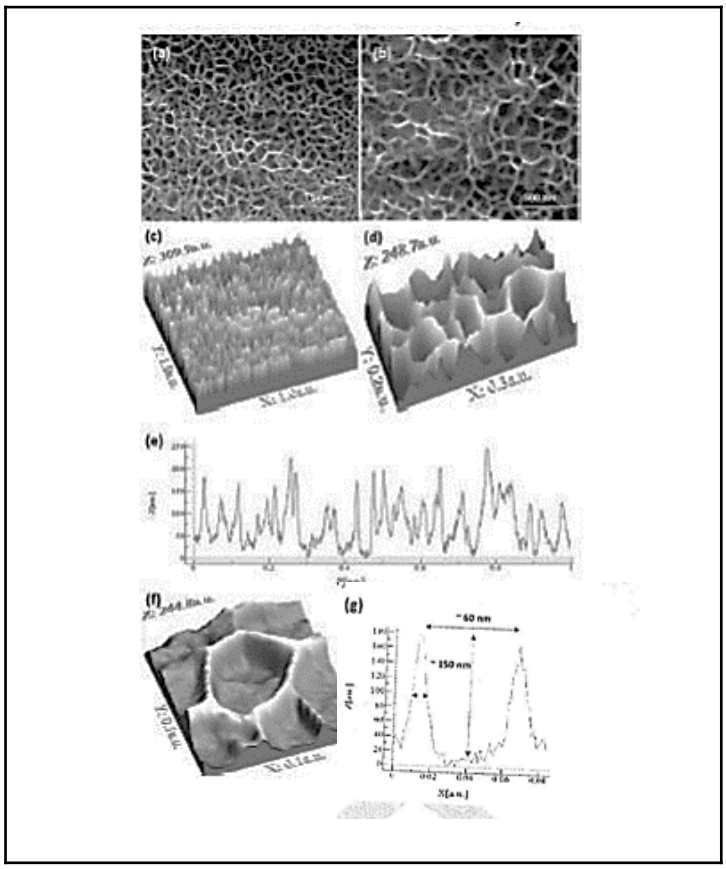

FIG. 2 illustrates a graphical representation of the FESEM images (a 24 and b) of anodized AZ-31 (40 V 20 min) using HF and ethylene glycol by 25 hybrid electrolyte preparation (c - g) 3D and 2D profiles of FESEM image (a)

TRL (Technology Readiness Level)

TRL-3, **Experimental Proof of Concept**

Research Lab

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