



Industrial Consultancy & Sponsored Research (IC&SR)

CORROSION RESISTANT TI-BASED THIN FILM METALLIC GLASS COATING AND A ROBUST METHOD OF PRODUCING THE SAME

IITM Technology Available for Licensing

Problem Statement

- The problem statement discussed in the present subject matter is **how to prepare a corrosion-resistant coating with good surface characteristics without the requirement of a base layer & which can be applied in a single step without the use of toxic solution processing.**
- Hence, Present invention provides the solution in efficient manner.

Technology Category/ Market

Technology: Corrosion Resistant Ti-based Thin Film Metallic Glass Coating;

Industry: Metal finishing Industry;

Application: solar cell, optical coating, PCB (Semiconductor Industry), 3-D Printing, Performance Coating.

Market: The global **thin film coatings** market is projected to grow **\$17.3B** by **2030** at a **CAGR** of **5.3%** during the period of **(2024-30)**.

Technology

- Present patent describes a **corrosion resistant DC sputtered Titanium (Ti) based thin film metallic glass coating and method of producing** the same. (Refer Fig. 1)
- The Corrosion resistant **DC sputtered Titanium (Ti)** based thin film metallic glass coating comprising an elemental composition **Ti_{60-x}Zr_xCu₂₅Ni₁₀Al₅**.
- Said glass coating exhibits **amorphous properties**, and wherein said glass coating has **dense microstructure**.
- Said **glass coating** has **adhesion strength** to the substrate of **120J/m²** even without a base & buffer layer coating.

- Said **glass coating** has a **thickness** in the range of **0.1 micrometer to 1 micrometer** with a roughness in the order of **1 nanometer to 10 nanometers**.
- Said glass coating comprises a mixture of complex oxide layers of **Ti, Cu, Ni and Al** when in **electrolyte** protecting it from **corrosion**.
- **A method** of producing **corrosion resistant Titanium (Ti) based thin film metallic glass coating** shown in flowchart. (Refer Fig.2)

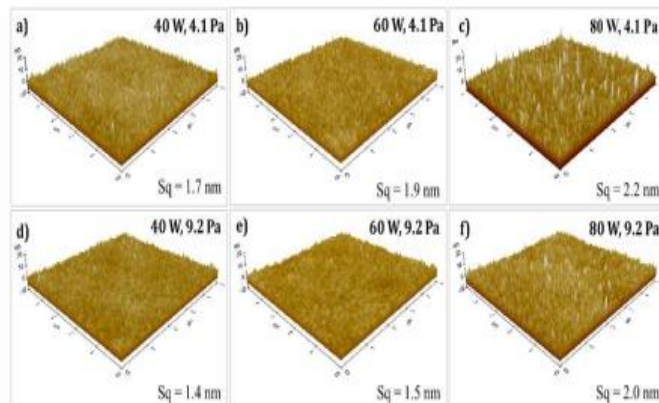


FIG. 1 illustrates AFM topography of metallic glass coating deposited at different DC power & Argon (Ar) pressure;

Intellectual Property

IITM IDF Ref. 2548; IN Patent No. 537736

TRL (Technology Readiness Level)

TRL-4, Technology validated in Laboratory

Research Lab

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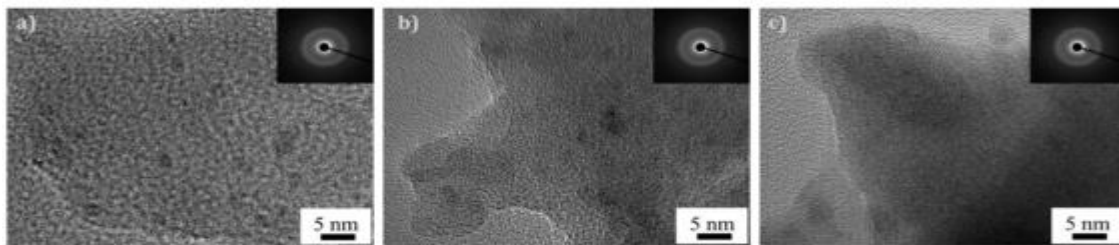
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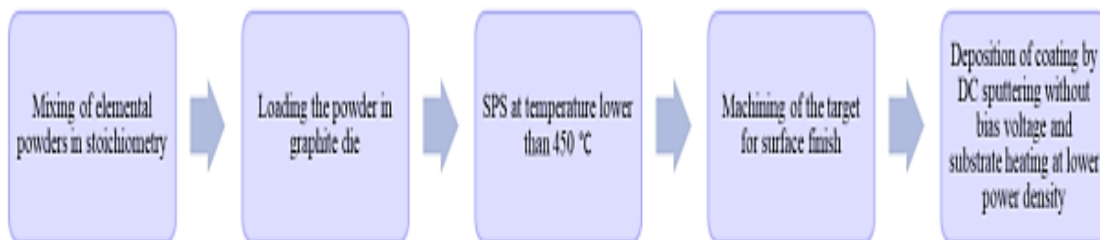
Images



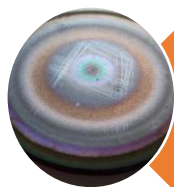
(a) $Ti_{60}Cu_{25}Ni_{10}Al_5$ (b) $Ti_{50}Zr_{10}Cu_{25}Ni_{10}Al_5$ (c) $Ti_{40}Zr_{20}Cu_{25}Ni_{10}Al_5$.

Fig.2 (Left) shows TEM micrograph & corresponding SAED pattern of metallic glass coating with different Zr content.

Fig.3 (right) depicts the flow chart showing the synthesizing steps of the metallic coating;



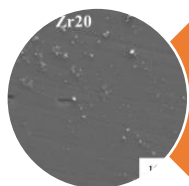
Key Features / Value Proposition



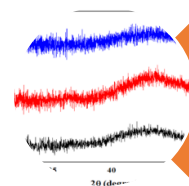
Provides cost-effective Ti-based metallic coating with a glassy structure which can resist corrosion because of its unique structure and composition, which can be applied by DC sputtering.



The glass coating of the present invention can be applied without any base layer still possess enough adhesion.



Method of producing of the glass coating comprises fabrication of a sputtering target by powder compaction followed by the deposition by DC sputtering at a relatively lower sputtering power density.



Metallic glass coating can be deposited from a multicomponent single target, & the coating has good corrosion resistance due to 1) amorphous structure, 2) elemental composition, & 3) featureless dense microstructure;

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