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香港城市大學
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A Nano-dual-phase Glass-crystal with Theoretical Strength and its Fabrication Method

- Energy & Environment
- Health & Wellness
- Manufacturing

Consumer Electronics
Energy Conservation/Generation/Management/Storage (Battery)
Nanotechnology and New Materials
Robotics
Sensors
Testing Instruments
Smart Mobility and Electric Vehicle

Opportunity

The single phase nanocrystalline alloys and single-phase metallic glasses have very high strength. However, they are usually softened at <2% strain with an ultimate stress around E/85-E/50 because of the reverse Hall- Petch effect and the softening effect of shear band, respectively. Therefore, they are very difficult to reach the theoretical strength of E/20. Here, we present an in-situ formed amorphous nanocrystalline cores-shells nanostructure for Mg-based nano-dual-phase glass-crystal, which exhibits theoretical strength of 3.3 GPa without sample size effect at room temperature. This strength is 3 times higher than that of the ever-reported strongest Mg alloy.

Technology

The present invention relates to a metal material and a method for use in fabricating thereof, and particularly, although not exclusively, to a metal material and a method for use in fabricating thereof by depositing a metal layer in a magnetron in just one sputtering process, which contains: fabricating alloy target; use surface cleaned Si, glass or polished alloy as substrate; positioning the target and the substrate in the sputtering chamber, and then depositing the metallic glass film on the substrate using appropriate sputtering parameters. The 0.5 to 50-μm-thick homogeneous film with a large area of 20 cm x 30 cm widens its industrial application. This work was published by Nature (2017) as a cover story.

Advantages

- Large area application for nanosized material
- Easy control the composition and thickness of the NDP-GC structure
- Widens strength material's application in metallic film area.
- Excellent biodegradable materials for bioimplants

IP Status
Patent granted

Technology Readiness Level (TRL) 7

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- Excellent mechanical properties for other light weights materials

Applications

- High wear resistance surface coating for laptop, smart phone, flexible electronics
- High strength MEMS devices
- 3D printing structures
- Mg based implants for orthopedic operation