Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Applying Composition Control to Enhance the Mechanical and Thermal Properties of Zr-Cu-Ni-Al-N Thin Film Metallic Glass JOSEPH LEE, JENQ-GONG DUH, National Tsing-Hua University — This study focuses on the correlations among the compositions of Zr-Cu-Ni-Al-N thin film metallic glass (TFMG) and their properties. The TFMG was prepared by DC magnetron co-sputtering technique with Zr-Cu and Ni-Al targets. By adjusting working power, pressure and nitrogen flow rate, thin films with various constituents were fabricated. Also, the effect of Zr/Cu ratio on the physical properties will be explored. With the increasing nitrogen content in the system, the hardness was improved up to 100% as compared to Zr-Cu TFMG. The strengthening mainly results from the atomic radii difference, and the enthalpy of mixing among mutual atomic bonding. In pursuit of high hardness, whether the coating still belongs to a metallic glass is critical. Differential scanning calorimetry (DSC) analysis further identifies the metallic glass characteristics of films with the formation of super-cooling regions. Finally, a Zr-Cu-Ni-Al-N TFMG with appropriate composition to exhibit improved hardness, thermal stability, and antimicrobial ability was revealed and discussed.

Joseph Lee
National Tsing-Hua University

Date submitted: 20 Jun 2015 Electronic form version 1.4