World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:07, 2015

# Effect of Chromium Behavior on Mechanical and Electrical Properties Of P/M Copper-Chromium Alloy Dispersed with VGCF

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**Abstract :** Microstructural and electrical properties of copper-chromium alloy (Cu-Cr) dispersed with vapor-grown carbon fiber (VGCF) prepared by powder metallurgy (P/M) process have been investigated. Cu-0.7 mass% Cr pre-alloyed powder (Cu-Cr) made by water atomization process was used as raw materials, which contained solid solute Cr elements in Cu matrix. The alloy powder coated with un-bundled VGCF by using oil coating process was consolidated at 1223 K in vacuum by spark plasma sintering, and then extruded at 1073 K. The extruded Cu-Cr alloy (monolithic alloy) had 209.3 MPa YS and 80.4 IACS% conductivity. The extruded Cu-Cr with 0.1 mass% VGCF composites revealed a small decrease of YS compared to the monolithic Cu-Cr alloy. On the other hand, the composite had a higher electrical conductivity than that of the monolithic alloy. For example, Cu-Cr with 0.1 mass% VGCF composite sintered for 5 h showed 182.7 MPa YS and 89.7 IACS% conductivity. In the case of Cu-Cr with VGCFs composites, the Cr concentration was observed around VGCF by SEM-EDS analysis, where $Cr_{23}C_6$ compounds were detected by TEM observation. The amount of Cr solid solution in the matrix of the Cu-Cr composites alloy was about 50% compared to the monolithic Cu-Cr sintered alloy, and resulted in the remarkable increment of the electrical conductivity.

**Keywords :** powder metallurgy Cu-Cr alloy powder, vapor-grown carbon fiber, electrical conductivity
**Conference Title :** ICMSEM 2015 : International Conference on Materials Science, Engineering and Manufacturing
**Conference Location :** Singapore, Singapore
**Conference Dates :** July 04-05, 2015