**Processing and characterization of high strength Cu-Al alloys fabricated through high pressure hot press**

**Sk. Mahammad Ali**

Metallurgical and Materials Engineering Department, National Institute of Technology, Warangal, 506 004, India *smdali14@gmail.com*

**G. Brahma Raju**

Metallurgical and Materials Engineering Department, National Institute of Technology, Warangal, 506 004, India

**ABSTRACT**

The present work investigates the effect of aluminium (0-15 wt.%) addition on microstructure, mechanical and tribological properties of copper. The initial powders were mechanically alloyed to attain uniform distribution of both the elements. The Cu-Al alloys were sintered at a temperature of 500oC and high-pressure of 500 MPa using the hot press in a vacuum environment. Microstructures of the hot-pressed samples reveal the reduction in grain size with the addition of Al content. The Cu-Al samples (Al upto 5 wt.%) consists of Cu-α solid solution phase and further addition of Al content upto 15 wt.% produced the α1 solid solution and γ intermetallic phases. The relative density of Cu-Al alloys was achieved upto ∼95%. The nano-hardness of sintered samples was increased from 2.38 to 7.88 GPa with an increase in Al content. The compressive strength of Cu-Al alloys was found to be 1106 MPa with 6.6% strain. The coefficient of friction and specific wear rate of pure copper decreased by 3.3 times and 19.8 times respectively. More significantly, the addition of a large amount of Al and high sintering pressure results in enhancement of mechanical and tribological properties of Cu.

*Keywords: Hot-pressing, Microstructure, Nano-indentation, Compressive strength, Wear*