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Thermo-Mechanical Treatments of Cu-Ti Alloys

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Abstract : This paper aims to study the effect of cold work condition on the microstructure of Cu-1.5wt%Ti, and Cu-3.5wt%Ti and hence mechanical properties. The samples under investigation were machined and solution heat treated. X-ray diffraction technique is used to identify the different phases present after cold deformation by compression and also different heat treatment and also measuring the relative quantities of phases present. Metallographic examination is used to study the microstructure of the samples. The hardness measurements were used to indicate the change in mechanical properties. The results are compared with the mechanical properties obtained by previous workers. Experiments on cold compression followed by aging of Cu-Ti alloys have indicated that the most effective hardening of the material results from continuous precipitation of very fine particles within the matrix. These particles were reported to be β`-type, Cu4Ti phase. The β`-β transformation and particles coarsening within the matrix as well as a long grain boundaries were responsible for the averaging of Cu-1.5wt%Ti and Cu-3.5wt%Ti alloys. It is well know that plate like particles are β – type, Cu3Ti phase. Discontinuous precipitation was found to start at the grain boundaries and expand into grain interior. At the higher aging temperature a classic widmanstätten morphology forms giving rise to a coarse microstructure comprised of α and the equilibrium phase β. Those results were confirmed by X-ray analysis, which found that a few percent of Cu3Ti, β precipitates are formed during aging at high temperature for long time for both Cu- Ti alloys (i.e. Cu-1.5wt%Ti and Cu-3.5wt%Ti).

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