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ELECTRICAL CONDUCTIVITY AND MICROSTRUCTURAL ANALYSIS OF Cu-Ni-Be ALLOY FOR ELECTRONIC DEVICES

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In this work a study for a Cu-Ni-Be alloy was development using a Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Spectrometer (EDS) and a milliohmmeter. The high strength of Cu-Ni-Be used in electronic connectors is thought to be due to the enhanced precipitation of nickel-rich beryllium intermetallic phases from the supersaturated solution and a dislocation structure after a thermomechanical treatment [3]. This TMT, as well as the effect of two final aging were evaluated.

Experimental Procedure

Six ingots were obtained by melting with electric-arc furnace and the concentration of Be range of 0,1 to 0,6%. All samples were homogenized at 955°C in resistance furnace and water quench at room temperature. These ingots were cold rolling with 35% reduction, pre-aging at 400°C and water quench. Other cold rolling with 60% reduction and two different final aging treatments at 380°C and 425°C. A Wolpert microhardness machine with 100g load and a model 4338B HP Milliohmmeter was used for mechanical and electrical analysis. The scanning microscopy was carried out on the Philips XL 30 combining the spectroscopy analysis.

Results and Discussion

Figure 1 shows the presence of a precipitate rich in nickel at matrix of copper after cold rolling and aging. The figure 2 presents precipitates at the structure after cold rolling and a TT. The electronic micrography in figure 3 shows the morphology of the precipitate. The increase of strength at the 0,3 and 0,6% Be alloys is a strong indicate the presence of beryllides and CuNi phases at copper matrix. The electrical conductivity values around 45% to 60% IACS agrees with other authors.

Conclusion

Cu-Be alloy are extremely hardened by aging at 250 to 400°C after quenching from solution treatment. The hardening is caused by the formation of G. P. zone and γ' e γ'' phases (CuBe')[1-2] and β-NiBe. A thermomechanical treatment developed for a Cu-Ni-Be alloy consists in solution treatment - cold rolling to 35% reduction - pre-aging at 400°C - cold rolling to 60% reduction - final aging in the temperature range of 350-450°C. This TMT are convenient to improve the mechanical properties without expressive lost in electrical conductivity.

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Acknowledgment

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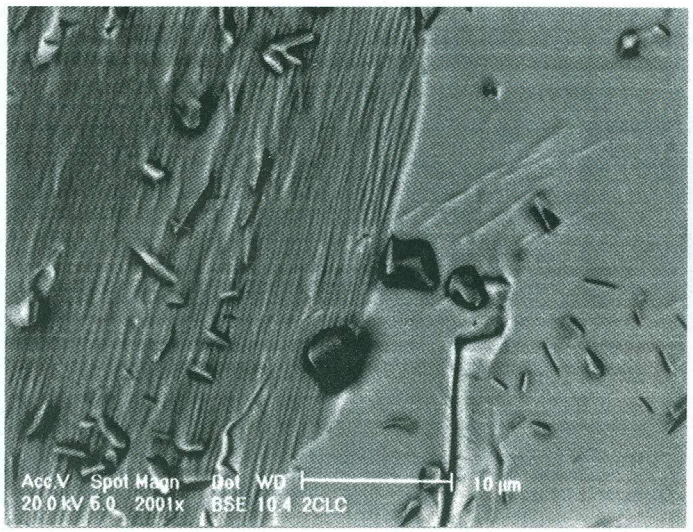

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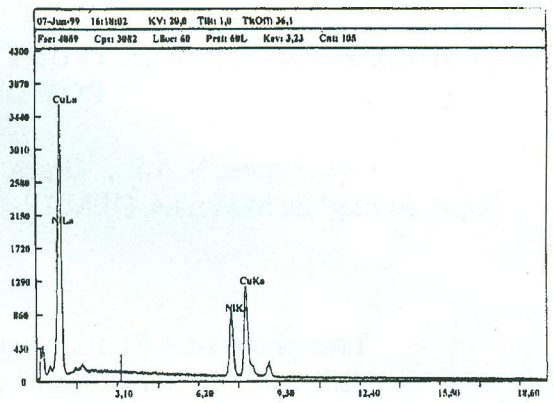
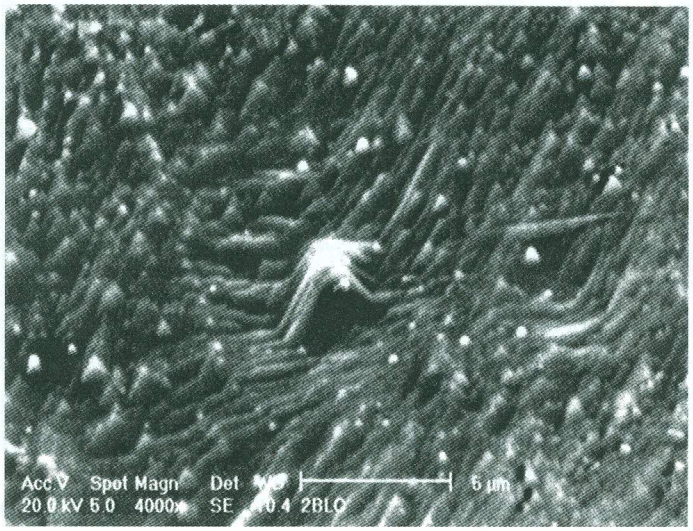


(b)

Figure 1 – (a) Showing Cu-Ni phases at grain boundary and (b) the spectroscopy – 0,6% Be after solution treatment.



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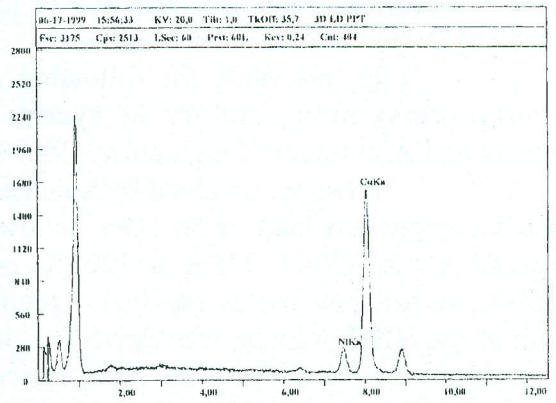

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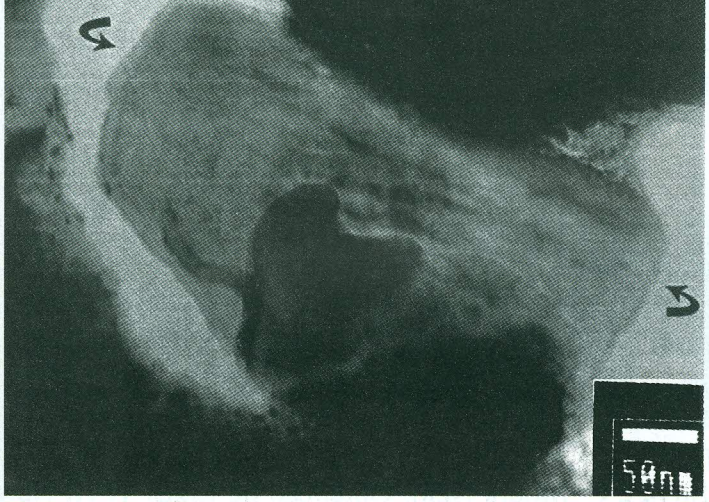
Figure 2 – (a) Showing Cu-Ni phases and (b) the spectroscopy – 0,3% Be after cold rolling and thermal treatment.



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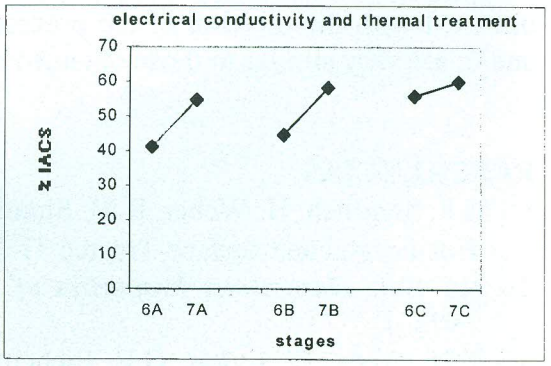

(b)

Figure 3 – (a) Micrography of beryllites precipitates by TEM - 0,3% Be and (b) eletrical condutivity.