

X-RAY PROBE ANALYSES OF COMPLICATED PRECIPITATES FORMED IN COPPER-BASE ALLOYS

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The electrical conductivity and mechanical properties of copper-base Cu-Ni-Si alloys can be improved by aging and cold rolling prior to aging. Further improvement of the properties can be achieved by addition of small amount of elements (e.g. Fe) to the alloy. In order to understand the mechanism of the improvement of the properties, the formation and growth processes of precipitates during aging were investigated by the analyses of anomalous small angle scattering (ASAXS) and X-ray absorption fine structure (XAFS). The ASAXS and XAFS results showed that the Cu-Ni-Si alloys without cold rolling exhibited growth of Ni₂Si precipitates with uniform size, whereas wide size distribution of Ni₂Si precipitates was formed in the cold rolled alloys. The wide size distribution was suppressed for the cold rolled alloy added with a small amount of Fe, resulting in formation of precipitates with homogeneous size. XRD measurements were also carried out to analyze microstructural change of Cu matrix with precipitation. The XRD results showed that the size of Cu crystallite in the cold rolled alloys without Fe addition became large at peak aging condition, while no significant size change of Cu crystallite was observed in the cold rolled alloy with Fe addition. It could be deduced that the wide size distribution of precipitates for the cold rolled alloys without Fe was related to the microstructural change in Cu matrix. On the other hand, the Fe addition is likely to result in homogeneous growth of precipitates.