The complete and incomplete grain boundary wetting in the Cu–Co alloys

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The phase transformations in the peritectic system Cu–Co has been studied. Grain boundary phase transformations can significantly change the properties of polycrystals [1, 2]. The most important grain boundary phase transformation is the transition from incomplete grain boundary wetting by the second phase to the complete one.

In this work the Cu–2.2 wt.% Co and Cu–4.9 wt.% Co as-cast alloys was studied. Previously, it was found that if the second wetting phase is solid, rather than liquid, the fraction of wetted boundaries can increase with decreasing, rather than increasing temperature like in systems Al–Zn and Co–Cu [3, 4]. Accordingly, the contact angle decreases with decreasing, rather than increasing temperature. This is because the energy of interphase boundaries (if the second phase is solid) can decrease with increasing temperature more slowly, than the grain boundary energy. It was a priori unclear whether a similar phenomenon will be observed in the case where we deal with a liquid wetting phase which is not enriched, but is depleted by the second component. We saw that in the case of copper–cobalt alloys, this is not observed, and the fraction of completely wetted boundaries and the contact angle behave similarly as for the melt enriched by the second component.

References

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