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Mechanical Properties and Microstructures of the Directional Solidified Zn-Al-Cu Alloy

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Abstract : Zn-7wt.%Al-2.96wt.%Cu eutectic alloy was directionally solidified upwards with different temperature gradients (from 6.70 K/mm to 10.67 K/mm) at a constant growth rate (16.4 Km/s) and also different growth rate (from 8.3 micron/s to 166 micron/s) at a constant temperature gradient (10.67 K/mm) using a Bridgman–type growth apparatus.The values of eutectic spacing were measured from longitudinal and transverse sections of the samples. The dependency of microstructures on the G and V were determined with linear regression analysis and experimental equations were found as λl=8.953xVexp-0.49, λt=5.942xVexp-0.42 and λl=0.008xGexp-1.23, λt=0.024xGexp-0.93. The measurements of microhardness of directionally solidified samples were obtained by using a microhardness test device. The dependence of microhardness HV on temperature gradient and growth rate were analyzed. The dependency of microhardness on the G and V were also determined with linear regression analysis as HVl=110.66xVexp0.02, HVt=111.94xVexp0.02 and HVl=69.66xGexp0.17, HVt=68.86xGexp0.18. The experimental results show that the microhardness of the directionally solidified Zn-Al-Cu alloy increases with increasing the growth rate. The results obtained in this work were compared with the previous similar experimental results.

Keywords : directional solidification, eutectic alloys,microstructure, microhardness
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