

Effect of Vanadium on the structure and properties of AA 6086

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The research studied effect of a small vanadium addition to the alloy AA6086, due to the several recognized positive impacts of use as a alloying element. The base alloy presents high strength Al-Mg-Si alloy 6086 which could be used for the demanding application in automotive industry. In comparison with the standard 6xxx alloys e.g. AA6082, it contain the small addition of Zr, which enhance the strengthening effect by formation of the Al_3Zr dispersoids and higher content of Cu which result in formation of Q' -AlCuMgSi hardening precipitates.[1, 2] One of the key vanadium contributions is improvement of mechanical properties and grain refining.[3-5] The researched alloys were prepared by direct casting and heat-treated under various cycles of time and temperature. Samples were examined by optical microscopy, XRD analysis and Vickers hardness measurements. The maximum hardness was achieved by alloy with vanadium (123,2 HV) after homogenization (450°C/30min) and isothermal aging at 170°/8h. Grain size analysis disproved the refining influence of vanadium to the alloy, which is confirmed in as-cast and homogenized condition. Alloy 6086 reach in average a mean grain diameter 213,9 μ m, what represent a 34% smaller grains in comparison with 6086 - 0,5V.

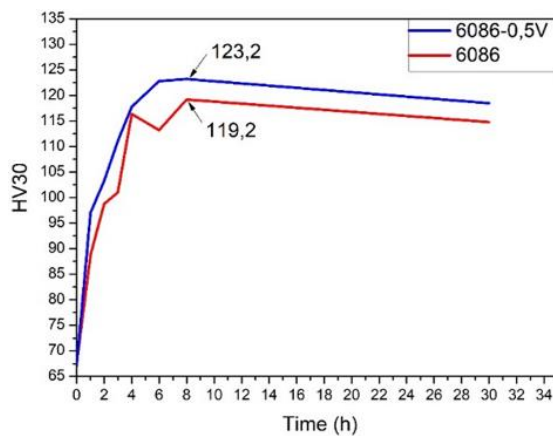


Figure 1: Development of peak hardness during isothermal heat-treatment

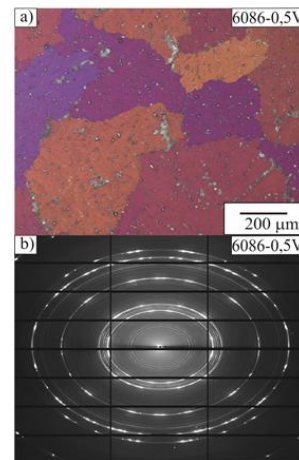


Figure 2: Grain analysis with use of light microscopy (a) and XRD (b) on homogenized sample with mean grain diameter (367,8 μ m).

References:

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