AZ31합금의 결정립계 미끄러짐

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Grain Boundary Sliding Characteristics of AZ31 Alloy Sheet

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Abstract

Since magnesium alloy has such a limited formability at room temperature, plastic forming processes at the elevated temperature have being developed. For example, stamping around the temperature of 473K has been known to be successful in terms of formability as well as die design. And superplastic forming could be applicable over 623K if the initial grain size is small enough. It is quite natural to assume that deformation mechanisms could evolve with temperature. In AZ31 alloy sheet, several deformation mechanisms including dislocation glide, twining and grain boundary sliding compete each other with temperature change.

In the present study, commercially rolled AZ31 alloy sheets were used to investigate grain boundary sliding characteristics with temperature. For all four grain sizes, elongation increased with temperature increment. However, the differences in grain size did not give a larger elongation differences even at the temperature range where superplastic deformation behaviors might be operating for small grained sheet. Microstructural observation showed that grain boundary sliding occurs in the case of smaller grained alloy while dislocation slip is dominantly operating for larger grains. Deformation assisted grain growth becomes evident at superplastic temperature of AZ31 alloy. Also, cavitation started at the very low level of strain under superplastic deformation condition. Initial strong basal texture remained after deformation irrespective of temperature. Therefore, it might be concluded that poor accommodation for grain boundary sliding of AZ31 alloy results from a limited slip systems even at the high temperature where grain boundary sliding becomes very active. Also, grain growth and compatibility problems during grain boundary sliding are discussed.

Key Words : AZ31 alloy, grain boundary sliding, grain growth, compatibility

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