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AZ31 Mg 합금의 집합조직과 벤딩 특성

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AZ31 Mg alloy Texture and Bending Characteristics

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Abstract

In this study, texture development and bending characteristics of strong {0002} textured were observed. AZ31 Mg alloy sheets were prepared along the angle of 0 and 12.5 degrees to the rolling direction or {0002} texture. Prepared samples with different angles to the rolling direction were rolled at room temperature condition and after subsequent heat treatment to investigate texture with x-ray diffractometer, respectively. The specimen having along the angles of 0 degree to rolling direction shows the highest load and 12.5 degrees specimen shows the highest displacement among any other specimens in bending test.

Key Words: AZ31 Mg alloy, Bendability, Formability, Cold Rolling, Microstructure, Texture, HCP, Basal Plane, 3-Points Bending Test, Tensile Test.

1. Introduction

During the last decade, many researchers have made very strong efforts to study the formability of Mg alloy sheet in automobile applications for weight savings [1, 2]. However, the number of possible applications of magnesium alloys is limited due to the low ductility and high anisotropy of mechanical properties. Magnesium alloy sheets have also poor formability, because of only few available slip systems in the hexagonal close packed (HCP) crystal structure at room temperature and it is attributed to a strong planar anisotropy where the {0002} basal plane tends to be set parallel to the rolling direction (RD) [3]. Severe deformation processes are one of the useful tools for improving formability through the grain refinement [4].

Many research works have been carried out on the formability of Mg alloys. It has been found that slip system occurs only on the basal planes {0002} texture of the HCP crystal structure at room temperature and other slip systems occur over about 200 - 250°C [5]. In this work, AZ31 Mg alloy sheets have strong basal plane {0002} texture. These sheets were cut along the angles of 0 and 12.5 degrees to the RD or basal plane {0002} and were used for 3-points bending test and tensile test at room temperature to compare the bendability and tensile parameters with the change of texture.

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2. Experimental procedure

Strong basal plane {0002} textured (or <0002> // ND textured) AZ31 Mg alloy sheets were cut along the angles of 0 and 12.5 degrees to the rolling direction or basal plane {0002} texture with dimensions of 20mm x 10mm x 0.7mm as shown in Fig. 1. Mg alloy sheets having the angles of 0 and 12.5 degrees to the RD were symmetrically cold rolled with different reduction ratios ranging from 0 to 45% on a laboratory rolling mill at room temperature and without lubricant condition. The sheet samples were reduced about 5% in thickness at each pass through rolling mill. Before and after cold rolling AZ31 Mg alloy sheets, having the angles of 0 and 12.5 degrees to the RD or basal plane {0002} texture, were investigated for bendability, ultimate tensile stress, elongation and texture by using 3-points bending tester, tensile test machine and x-ray diffractometer, respectively. Before tensile test, 45% cold rolled samples have a heat treatment at 150°C for 30 minutes.

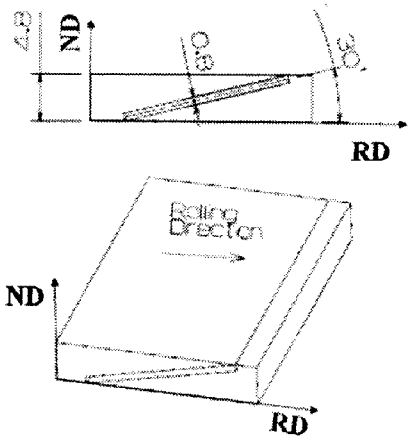

Fig. 1 Initial sample preparation method

3. Results and Discussion

Fig. 2 shows the bending characteristics of initial samples with 0 and 12.5 degree angles to the RD or basal plane {0002} texture. Samples with 0 and 12.5 degree to the RD show the highest stress and the highest strain, with increasing degree of prepared samples to the RD, stress and strain were decreased in Fig. 2.

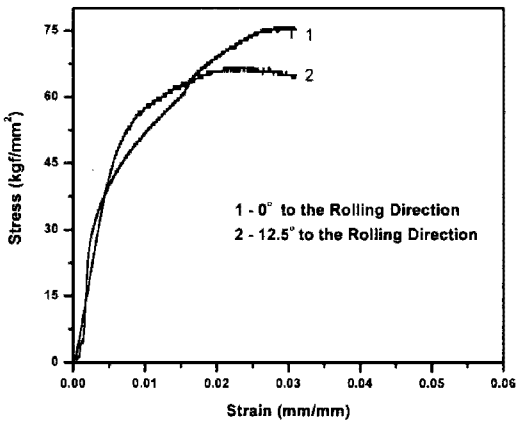

Fig. 2 The result of 3-points bending test corresponding to: 1- initial sample with 0° to the RD, 2 - initial sample with 12.5° to the RD

4. Conclusion

(1) Initial sample with 12.5° to the RD shows the lower displacement than sample with 0° to the RD

5. References

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