한국소성가공학회 2008년도 춘계학술대회 논문집 pp. 480~481

AZ31 마그네슘의 집합조직변화와 압연특성

사이드무로드 아크라모프[1] · 김인수[1#]

Texture and Rolling Characteristics of AZ31 Magnesium Alloy

S. Akramov[1], Insoo Kim[1#]

Abstract

The aim of this work is to compare the microstructure, the texture, of an AZ31 Mg alloy processed via cold rolling process. Initial AZ31 Mg alloy sheet samples with strong {0002} texture were cut along the angles of 12.5 and 25 degrees to normal direction (ND). These specimens were rolled in room temperature condition. The microstructure was characterized by optical microscopy and the texture was measured by X-ray diffraction.

Key Words: Magnesium sheet, Microstructure, Texture, Formability

1. 서 론

In order of weight saving more researchers interested in Magnesium alloys since it is the lightest metal that can be used for bodies of light weight transportations [1]. It is well know that magnesium alloy sheets have poor formability, because only few slip systems available in hexagonal close packed crystal structure at room temperature. Severe deformation processes are useful tool for improving formability through the grain refinement. A grain refined materials are stronger than in a coarse grained state because of grain size hardening [2].

Many studies have been carried out on the deformation of Mg alloys. The results of these studies shown that up to about 200° C, slip occurs readily on the basal planes (0001) of the hexagonal crystal structures [3].

In this work a rolled AZ31 Mg alloy was using cold rolling processes at room temperature, with the aim of comparing the resulting microstructures as well as their texture development.

2. 실험 방법

Strong {0002} textured (or strong {0002} // ND textured) AZ31 Mg alloy sheets were prepared. These specimens were cut along the angles of 12.5 and 25 degrees to normal direction (ND). The sheet samples, with dimensions of 20mm x 10mm x 0.7mm, were prepared from a sheet along the rolling direction. The prepared Mg alloy sheets were then symmetrically rolled to different reductions ranging from 0 to 40% on a laboratory rolling mill in room temperature condition. The sheets samples were reduced about 5% in thickness at each pass. Cold rolled AZ31 Mg alloy sheets along the angles of 12.5 and 25 degrees to normal direction were investigated the microstructure and texture with the optical microscope and x-ray diffractometer, respectively.

3. 결과 및 토의

Texture measurements were performed at one tenth (S=0.9) thickness of the symmetrically rolled sheets. (0002) pole figures were obtained by using the Cu-Kα radiation with the Schultz reflection method. Fig. 2 shows (0002) pole figures the change in texture of the AZ31 Mg alloy after symmetrical rolling compared to the texture before rolling and initial sample. Strong basal texture is observed in initial Mg alloy sheet Fig. 1(a). At initial samples prepared with angles 12°30' and 25° basal

1. 금오공과대학교 신소재시스템공학부
교신저자: 금오공과대학교 신소재시스템공학부,
E-mail: iskim@kumoh.ac.kr

texture pole shifted respectively for 12°30' and 25° degrees. With cold rolling up 40% reduction in thickness texture of 0° samples retained all thought it change in intensity about 20%. After large strain samples with 12°30' and 25° degree to the ND with rotated to the ND direction.

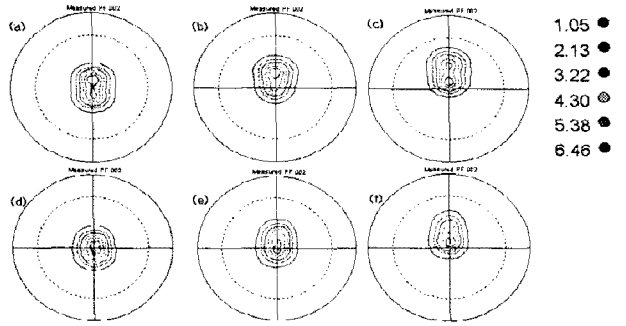

Fig.1. (0002) Pole figures from one tenth surface layer S=0.9 (a) initial (0° to ND) AZ31 Magnesium alloy sheet, (b) initial 12°30' to ND sample, (c) initial 25° to ND sample, (d) 40% cold rolled initial sheet, (e) 40% cold rolled 12°30' to ND sample, (f) 40% cold rolled, 25° to ND sample.

The microstructure of the as-received material is formed by coarse, equiaxed grains, about 20–30 μm size and finer grains were observed(Fig. 2 a, b, c). After cold rolling, grain size is decreased.

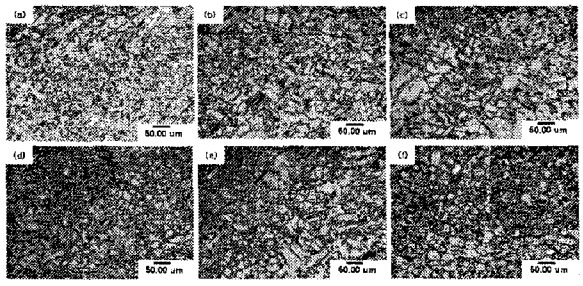

Fig.2. Optical micrographs corresponding to: (a) initial (0° to ND) AZ31 Magnesium alloy sheet, (b) initial 12°30 to ND sample, (c) initial 25° to ND sample, (d) 40% cold rolled initial sheet, (e) 40% cold rolled 12°30' to ND sample, (f) 40% cold rolled, 25° to ND sample.

4. 결 론

In the present study the microstructure and texture development of AZ31 Magnesium alloy sheet during symmetric cold rolling was investigated using different basal plane textures. The following conclusions are summarized from this research work:

(1) The specimens having along the angles of 12°30' and 25 degrees to normal direction showed fine microstructure than {0002} textured specimens (0 degrees specimens).

참 고 문 헌

[1] R.Z. Valiev, R.K. Islamgaliev, I.V. Alexandrov, Prog. Mater. Sci. 45 (2000) 103.

[2] M. Furukawa, Z. Horita, M. Nemoto, T.G. Langdon, Mater. Sci. Eng. 324 (2002) 82.

[3] E. F. Emley: Principle of Magnesium Technology, Pergamon, Elmsford,NY, 1966, p. 483.