The effect of hot rolling reduction on microstructures and textures of grain oriented silicon steel was studied by optical microscopy (OM), zeiss ultra 55 Scanning electron microscope (SEM) and Electron backscatter diffraction (EBSD) technique respectively. The results indicate that the effect of hot rolling reduction on grain size of hot rolled and normalized sheets in surface layer is great, while the effect on grain size of primary recrystallized grain is little. The shear zone thickens with the finishing reduction decreases, moreover strong {111}<112> and {110}<001> textures can be obtained in hot rolled sheets. Combined with the previous research conclusions, it can be found that the rolling process of oriented silicon steel is contributed to the formation of texture, while the recrystallization process reduces the sharpness of the texture.

Keywords: grain oriented silicon steel; hot rolling; reduction; microstructure; texture
grain size ratio of 50-sample is 35 – 44 %, while that of 40-sample is 32 – 34 %. It shows that more dynamic recrystallization grains can be obtained under the large finishing reduction.

Figure 3 shows the microstructures of decarburized strips. It can be recognized that the finishing reduction has little effect on grain size and homogeneity of primary recrystallized grain. According to the statistical results, the grain size difference between the two samples is about 0.2–0.8 μm, while the standard deviation difference is about 1μm.

TEXTURE ANALYSIS

Figure 4 shows the EBSD orientation maps of the hot rolled sheets. It can be seen that shear textures such as {110}<001> and {110}<112> are the main texture components in surface layer of the samples, while the main texture components of center layer are deformation textures such as α fibre texture <110>, {111}<112> and {114}<481>. Specifically, the shear surface region of the 40-sample is thicker, and more {110}<001> oriented grains can be found in surface layer. Moreover, the strong {100}<011> texture is formed in center layer of 40-sample due to the small finishing reduction.

Figure 5 indicates the EBSD orientation maps of the normalized sheets. It can be seen that the surface layer is consisted of coarse recrystallized grains, and the center layer is consisted of the recovered and recrystallized grains. The texture components is basically in accordance with that of which the hot rolled sheets after normalizing, but the sharpness decrease significantly, furthermore the {114}<481> and {110}<001> are dominant textures. Compared with the 50-sample, more {110}<001> oriented grains can be seen in surface layer but less {114}<481> oriented grains can be seen in center layer of 40-sample.

The EBSD orientation maps of the decarburized strips are shown in Figure 6. It is demonstrated that the recrystallized structure is fine and uniform after decarburizing and nitriding. The grain size of primary recrystallized grains decreases from 21.73 μm in 50-sample to 20.30 μm in 40-sample with the decrease of the finishing reduction. It can be found that the texture components of decarburized annealed strips are mainly...
The texture component of normalized sheets is in accordance with that of the hot rolled sheets. The sharpness of texture is weak after hot rolling and normalization, but it is strong after cold rolling and decarburizing. The shear zone thickens with the finishing reduction decreases, moreover strong \{111\}<112> and \{110\}<001> textures can be obtained in hot rolled sheets.

Acknowledgements

This work is financially supported by Liaoning province Department of Education fund item, No. LJKZ0305.

REFERENCES


Note: The responsible translator for English is Yuan Yuan Shao, University of Science and Technology Liaoning, Anshan, China