

THE EFFECT OF PRIOR ϵ MARTENSITE CONTENT ON THE SHAPE MEMORY EFFECT IN Fe - 17%Mn ALLOY, Joong Hwan Jun and Chong Sool Choi, Department of Metallurgical Engineering, Yonsei University, Seoul 120-749, Korea

The composition of the alloy used in this study was Fe - 16.72%Mn - 0.02%C in wt.%. This alloy was homogenized at 1150°C for 24 hours in the protective atmosphere. The transformation temperatures, M_s , A_s and A_f were determined by using DSC, and they were 158°C, 185°C and 220°C. The alloy quenched into the water bath from 1050°C was composed of about 60 vol.% ϵ + retained γ . The purpose of this study is to investigate how the SME of the alloy varies with the ϵ volume fraction. Therefore the alloy should have a wide range of ϵ volume fraction. In order to change ϵ vol.% greater than the quenched state, the alloy was cycle-treated from room temperature to 255°C. On the other hand, for the variation of ϵ content below the quenched state, the alloy was maintained for various times at a temperature just below M_s temperature, i.e. the stabilization treatment of the austenite was undertaken. In this way, we could change the ϵ martensite content from 30 vol.% to 92 vol.%. The SME measurements for these ϵ contents were made by using a bending method.

The SME decreased with increasing ϵ content, showing a minimum value around 60 vol.% ϵ , and then the SME increased with increasing ϵ content above 60 vol.% ϵ . To know the reason, we observed the microstructures before and after bending for the two alloys with ϵ contents below and above 60 vol.% ϵ . It was found that the bending deformation occurs by two types. One is the deformation due to the formation of stress-induced ϵ martensite, which is applied to the structures with lower ϵ contents. The other is the deformation due to coalescence of ϵ plates, which is applied to the structures with higher ϵ contents. However, if the deformation strain is greater than 2%, the strain is due to formation of the stress-induced α' martensite in addition to the coalescence of ϵ plates. It was found that the deformation due to α' formation does not bring SME at all by heating above A_f of α' .