materials before and after shock loading. Surface trace analysis was used to find the habit planes of the transformed regions, and orientation relations were determined by electron diffraction.

The Fe-7.37 Mn specimens shock loaded to 90 kb had plates of γ transformed from α-martensite. Tilting of the specimen showed that the γ bands were not remnants of the martensite. The γ plates were surrounded by deformation twins in the martensite and were associated with screw dislocations lying on the $\{110\}_M$. At 150 kb, the plates observed were internally twinned on {111} planes, and it is believed that the internal twins are associated with an inhomogeneous shear in the $\alpha' \rightarrow \gamma$ transformation. These internal twins were similar to those observed by Bowden and Kelly (8) in Fe-Ni. At 300 kb, extensive transformation occurred.

Single surface analysis was employed to determine the habit plane for a particular variant of the orientation relationship. The angle between the habit plane and the foil normal was calculated using the foil thickness values (2500 A°) and the projected width of the α habit plane interface. In this way, the position of the habit plane normal on the great circle was determined via single surface trace analysis.

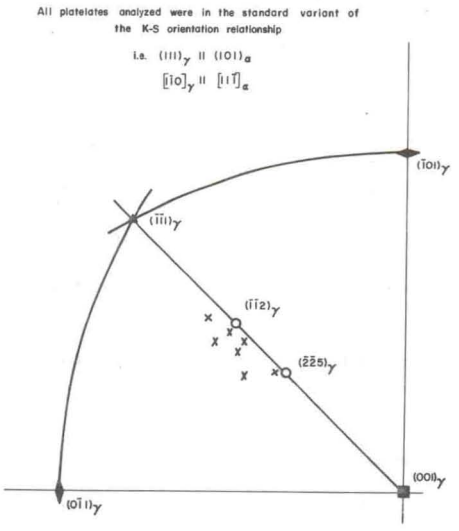

FIG 1

Stereographic projection of habit planes observed at 90 kb.

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SHOCK INDUCED MARTENSITIC TRANSFORMATIONS IN BCC Fe-Mn

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1. Introduction

Recent experiments have shown that BCC α-iron transforms to a close-packed phase under shock pressures[1,2]. The effect of dynamic pressure produced by intense shock waves on the pressure volume relations was first studied by Bancroft, Peterson and Minshall[3]. The nature of the high pressure phase which must form and revert in the order of 10^{-6} seconds has not been established. Static experiments however, have shown that in pure iron, at room temperature, the high pressure phase is hexagonal close packed ε [4,5].

The addition of alloying elements to iron modifies the temperature pressure diagram, and the stability of the γ or ε fields can be increased by the addition of manganese. Consequently, the shock loading of the Fe-Mn alloys which have been subzero quenched to form α-martensite (α'), results in a pressure induced $\alpha' \rightarrow \gamma$ transformation for the Fe-7.37 wt % Mn alloy and $\alpha' \rightarrow \varepsilon$ for the Fe-14 wt % Mn alloy. It is the object of this paper to report the morphology and crystallographic features of the α' to γ and α' to ε transformations.

2. Experimental Methods and Results

The Fe-Mn alloys were austenized for five hours at 950°C and then quenched to 77°K. This subzero quench produced 86% α-martensite in the alloys. Foil specimens of the alloys, 3 cm by 3 cm were shock loaded to peak pressures of 90, 150 and 300 kb using the driver plate technique[6]. Thin foils suitable for transmission electron microscopy were prepared from

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