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DIFFRACTION EFFECTS IN $\beta$ Cu-Zn AND $\beta$-Cu-Zn-Al SURFACE MARTENSITE TRANSFORMATION AND MICROSTRUCTURE

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Several recent investigations have shown that the extra maxima which appear in the electron diffraction patterns of $\beta$ Cu-Zn, $\beta$ Cu-Zn-Al and other similar $\beta$ phase alloys are neither due to any premartensitic precursor phase (1-4) nor due to an $\alpha$-phase (1-3). It has been proposed instead, that these maxima may be attributed to martensite present on the surfaces of the samples (1-3). The crystal structure and number of variants of the surface martensite exhibits sensitive dependence on the surface orientation of the sample (1,3).

The existence of a surface transformation has now been confirmed from the abrupt disappearance of extra maxima on heating and their reappearance on cooling during in situ studies in the electron microscope. Temperatures associated with this surface martensite transformation are much higher than the bulk martensite transformation temperatures in the same alloy. Besides, surface martensite is present even if the composition of the sample is such that no bulk transformation is expected to occur in the sample (e.g. equiatomic Cu-Zn). The temperature difference between the disappearance and reappearance of surface martensite is much larger than the corresponding difference associated with the bulk martensite transformation.

The surface martensite layer is 7-10 nm thick and its microstructure is sensitive to the uniformity of the surface after electropolishing of the samples. Less uniform surfaces are associated with larger martensite plates. Some other features of the surface martensite are similar to those of the bulk martensite.

Surface martensite contributes to the overall mottled image contrast observed during examination of the foils. "Shimmering" or "streaming" of the contrast is most likely due to orientation changes of the foil produced by thermal stress that are set up when the electron beam interacts with the sample as already proposed in ref. 4.

Details of these results and their discussion will be published elsewhere.

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3. F. C. Lovey, M. Chandrasekaran and M. Ahlers, Z. Metallkd, 72, 43 (1981)