SHORT COMMUNICATIONS

A note on Dr. M. J. Frost's paper

THE observations that Dr. Frost has made in the previous paper might have important metallurgical implications, because the twinning he has described in Mukerop and Great Namaqualand (and which is also encountered in Laurens County and a specimen of Toluca, B.M. 1959, 1048) is usually taken as evidence for plastic deformation of the face-centred cubic solid solution, γ, at a temperature above its recrystallization temperature. Such deformation is called hot working when it is encountered in commercial alloys. The 'large-scale grain contacts' of Kameelhaar (B.M. 1941, 1) probably represent recrystallization grain boundaries in the hot-worked structure.

These twins and recrystallization grain boundaries represent macroscopic aspects of plastic deformation, which has been annealed out of the γ structure by solid-state recrystallization. However, on a microscopic scale, plastic deformation takes place by slip on favoured crystallographic planes, slip planes, and any such microscopic slip deformation may provide the nucleation site for precipitation process. It is usually the case that slip deformation also promotes the precipitation process and causes it to take place earlier than it would in the absence of slip.

In face-centred cubic metals the most usual slip planes at room temperature are octahedral, but at elevated temperatures the situation becomes less distinct and cubic slip may be permitted; thus the cubic orientations of kamacite, which predate the octahedral orientations, are probably nucleated on cubic slip planes in the parent γ just before the normal octahedral precipitation is due to commence. Similarly, the cubic orientation of sulphide plates with respect to the parent γ may have been induced by earlier slip at a higher temperature. In the case of Mukerop (B.M. 85891) it appears that the sulphide plates formed in the parent before the recrystallization twins were produced.

The mechanical process which leads to hot working of the iron could arise from thermal contraction stresses or the movement of overburden in the meteorite parent body.

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