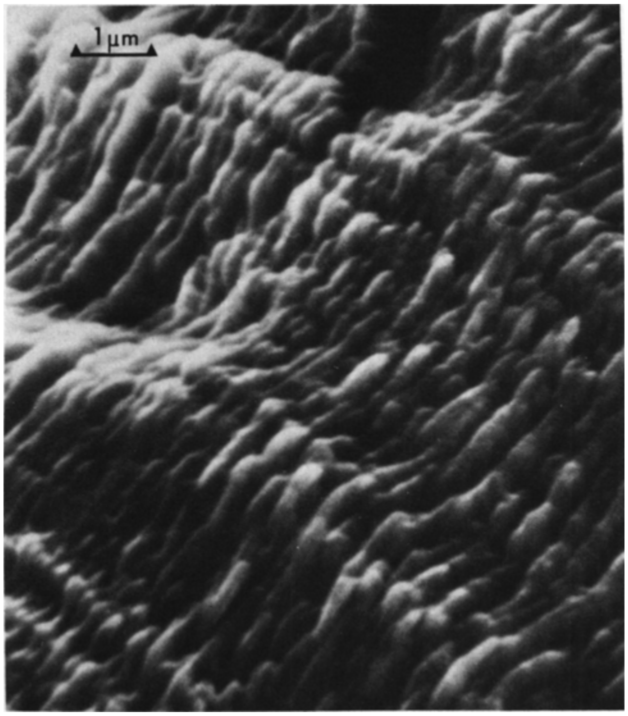

Fig. 7—SEM micrograph of titanium chip at higher magnification. The morphology here is similar to that observed in copper, aluminum and steel chips although the spacing varies with material and orientation. Marker = $1 \mu m$.

depth of cut. Both chips were made with a 75 deg diamond knife in a Porter Blum MT-1 microtome. The thinner chip (~1000Å thick) has a periodic lamella spacing of 1400 to 1800Å compared to that of 3000 to 4000Å for the thicker chip (~5000Å thick) showing the increase in lamella thickness with depth of cut. The marked similarity between the internal structure as observed in transmission and the external morphology demonstrates the power of this technique for studying the microscopic adiabatic shear mechanism.

These micrographs clearly demonstrate that it will be of great advantage to examine chips which are thin enough for high voltage transmission electron microscopy examination and still thick enough to have external morphology which can be resolved in the SEM. When such chips are produced under carefully controlled laboratory situations wherein the applied loads, cutting speeds, and depths can be accurately measured, while the temperature of the material is controlled, much additional information about this form of plastic instability will be available. It will be possible to study the effects of crystal orientation, stacking fault energy, grain size, and second phase particles on the defect structure and morphology simultaneously as well as to examine the effect in the variation of many cutting parameters.

The evidence that the same failure mechanism is operating in bcc and cph materials in a fashion similar to what was observed in fcc metals is certainly a strong argument that there is a universal form of plastic instability occurring in chip formation processes.

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Addendum

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