



CoA Memo. No. 147

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THE COLLEGE OF AERONAUTICS
DEPARTMENT OF MATERIALS



Extended plasticity in commercial-purity zinc sheet

- by -

Harry Naziri and Roger Pearce

S U M M A R Y

Some microstructures are presented, following on from CoA Memo. No. 137. Annealed c.p. zinc deforms predictably, while the as-rolled metal retains the equiaxed grain-size produced by room-temperature rolling. Some evidence of grain growth is apparent in the material strained at 0.2 in/min.

Introduction

CoA Memo. 137 describes extended plasticity in commercial-purity zinc. The mechanism of this deformation was not shown. The present brief report contains some photomicrographs of structures produced by high and low crosshead speeds on as-rolled and rolled and annealed metals.

Results

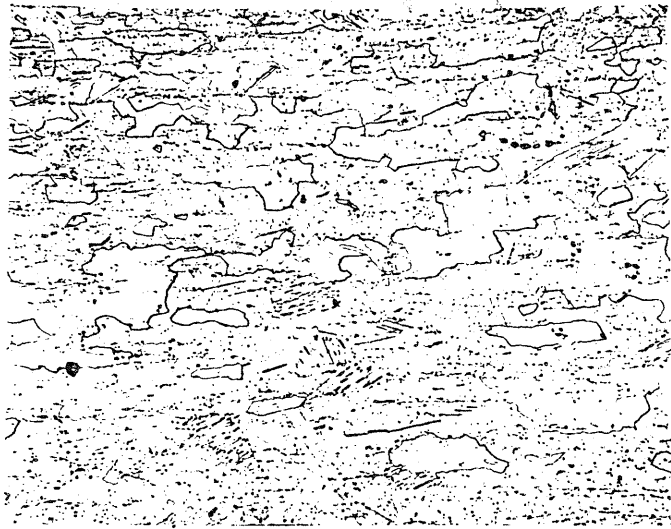
Figure 1 shows the recrystallized material (X200) before deformation, and after tensile straining at high and low speeds to failure (about 50% total elongation). Grain deformation is evident, and the lead stringers appear more prominent after deformation and the structure appears more 'disturbed' after high speed deformation.

Figure 2 (X1000) show as-rolled material deformed and undeformed (grip ends) as described. The specimens were only very lightly etched. The grain size of the specimen strained at 0.2 in/min has grown during deformation (a \rightarrow b). The lead stringers are more fragmented after low-speed than high-speed deformation.

Figure 3 shows the same specimens (X3000). Little extra information is conveyed here.

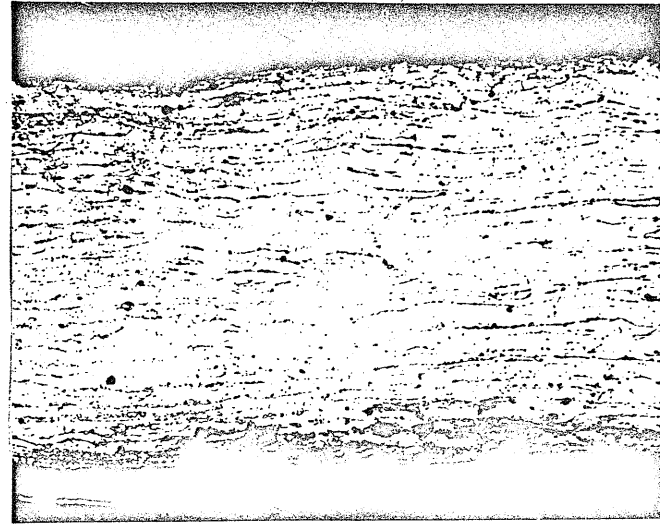
Conclusions

Some work on grain rotation and change in preferred orientation is now required to see whether either of the current theories, i.e., grain-boundary sliding or continuous recrystallization, can be applied to this phenomenon.

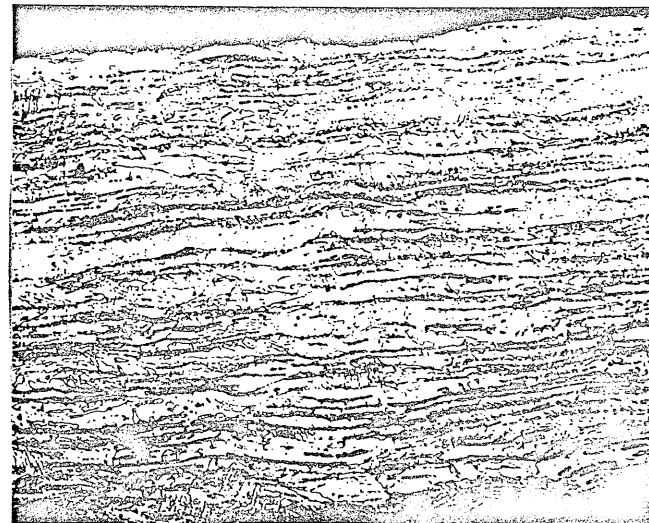


Rolled 90% Reduction and
Recrystallized at 200°C
for 15 mins.

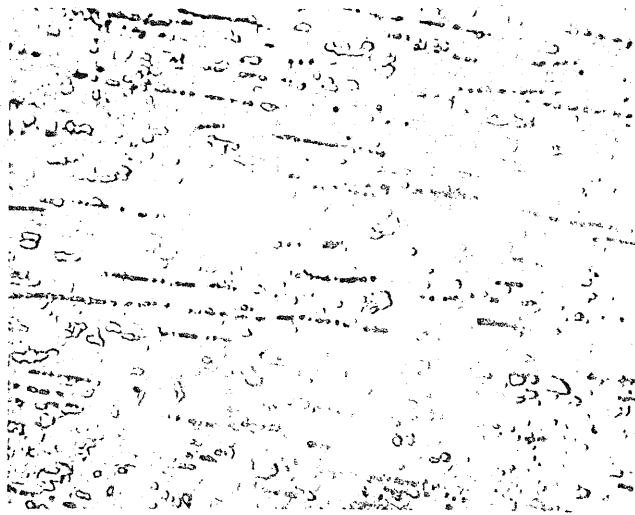
Long Sections.
All x 200 Mag.



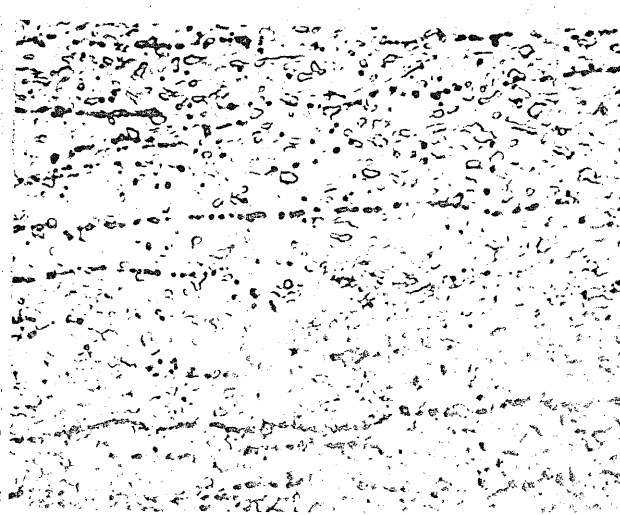
Specimen Strained at 0.2in/min.



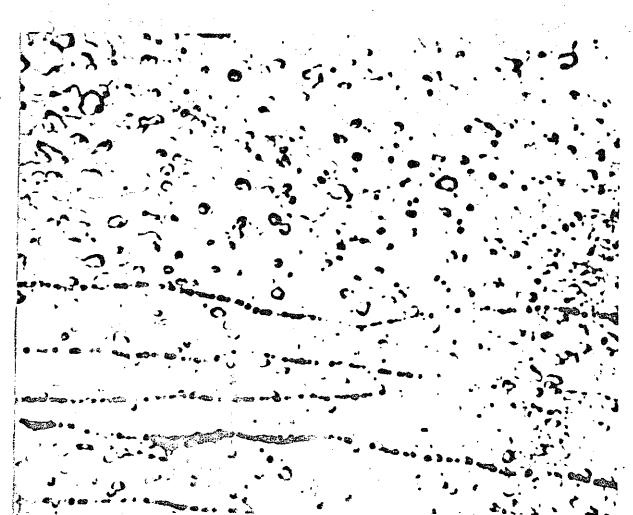
Specimen Strained at 20in/min.



Rolled 90% Reduction

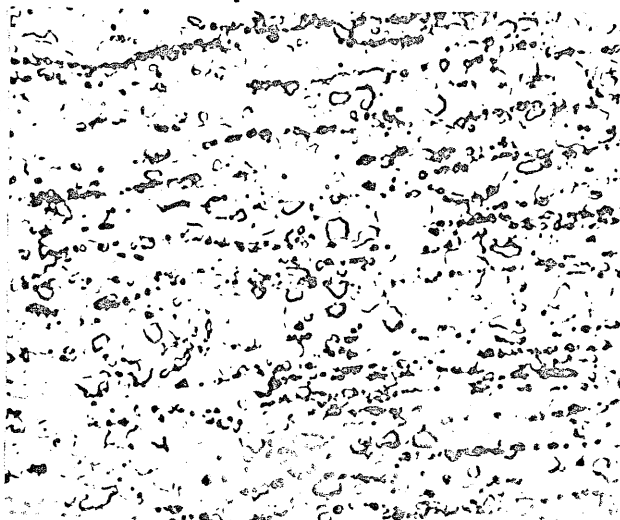


Grip ends

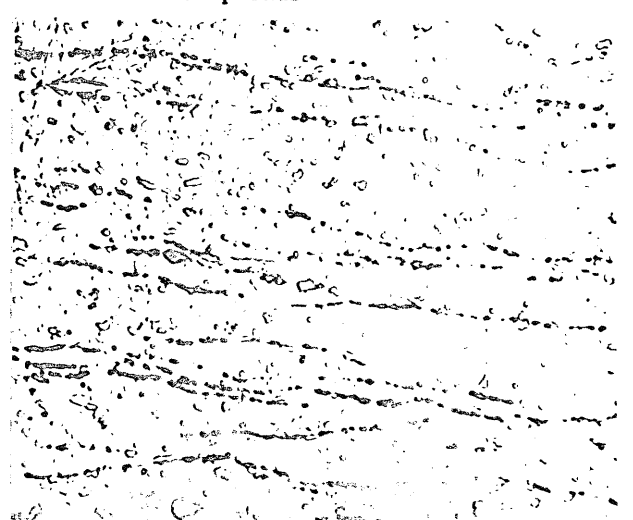


Grip ends

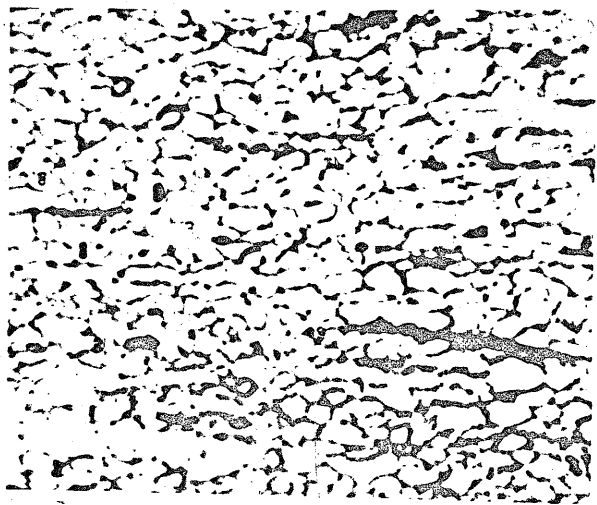
Long. Sections.
All x1000 Mag.



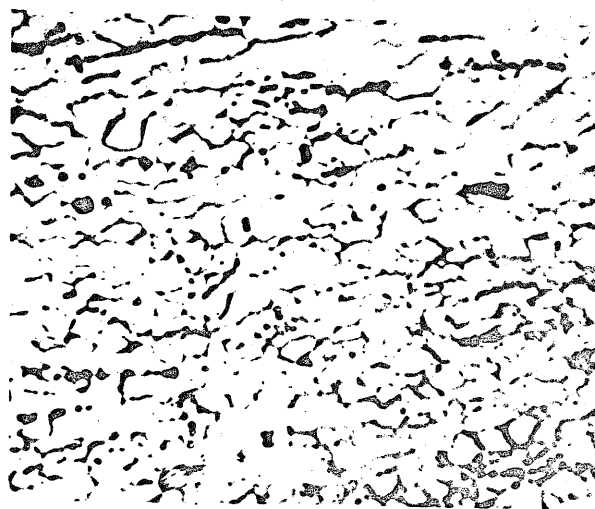
Specimen strained
at 0.2 in/min.



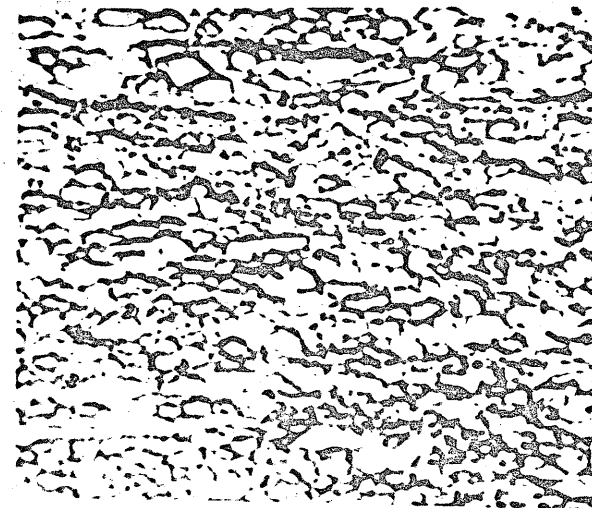
Specimen strained
at 20 in/min.



Rolled 90% Reduction

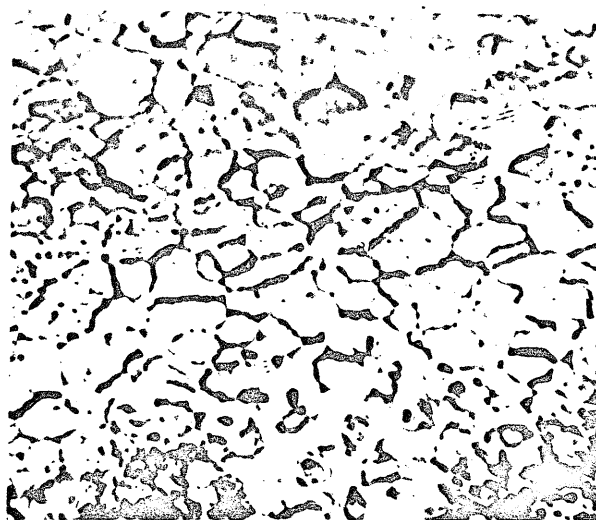


Grip ends

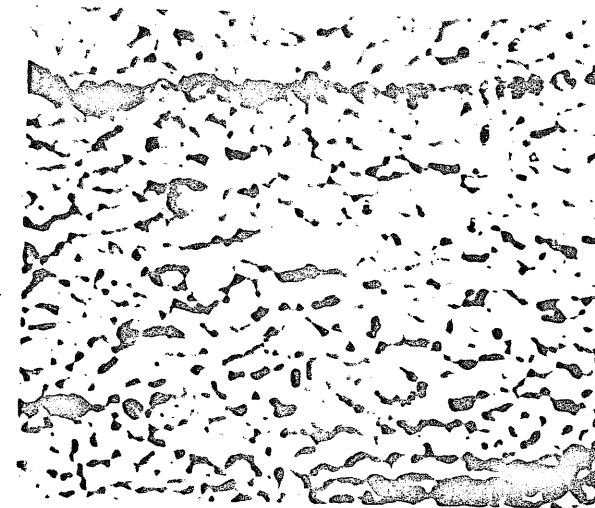


Grip ends

Long Sections.
All x 3000 Mag.



Specimen strained
at 0.2 in/min.



Specimen strained
at 20 in/min.