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Strain hardening behaviour and the Taylor factor of pure magnesium

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Abstract

Taylor orientation factors for strain hardening in textured and random polycrystals of magnesium were derived from the ratio of the strain hardening rates of polycrystals to that of s

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Notes

Notes

1. Kelley and Hosford [13](#) showed that the yield surface of textured polycrystals of pure Mg is highly non-equiaxed due to the stress asymmetry of twinning; however, it takes a nearly equiaxed shape after the first 6–8% strain, once twinning is over.
2. Preserving the yield surface's initial shape requires strain hardening proportional to the current flow stress, an assumption which is not easy to justify by dislocation theory [3](#).
3. The scales in [Figures 1](#) through [4](#) are related by the Taylor factors $M_{\sigma} = M_{\epsilon} = 4.5$. A higher or lower M value, respectively, decreases or increases the relative slope of the polycrystal curves.
4. It is noted that Graff et al.'s modelling [17](#) ignored possible contributions from twinning modes other than $\{10\bar{1}2\}$. More complex modes of twinning are known to become active at high stresses in Mg, and were indeed observed by Kelley and Hosford in their experiments [13](#), so the picture presented by [Figure 5](#) is likely to be over-simplistic at very large strains.
5. $\langle c + a \rangle$ slip is active in single crystal [47](#), and contributes to the polycrystal yield surface.



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