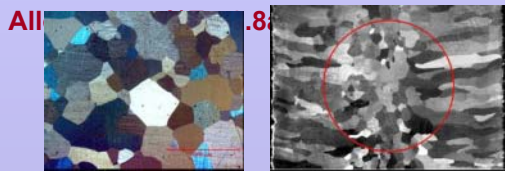
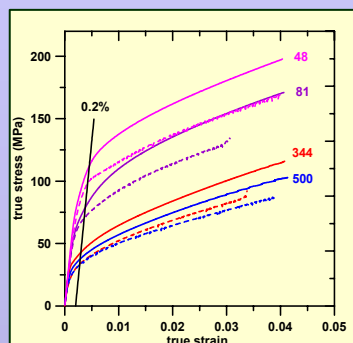
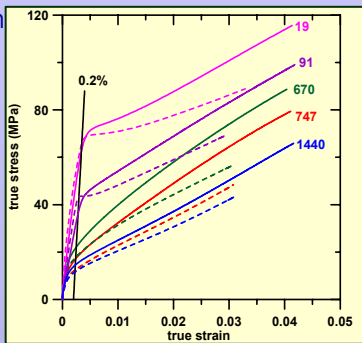


The Hall-Petch parameters of random polycrystals of Mg and alloys depend on

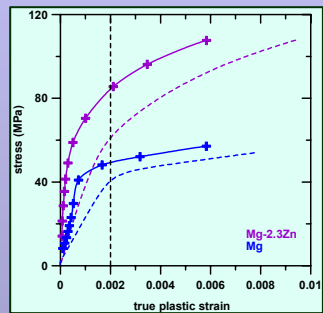
- ❖ the loading direction (because of the t/c asymmetry)
- ❖ the solute concentration (solid solution softening and hardening effects, and the development of SRO)
- ❖ pseudoelasticity effects stemming from



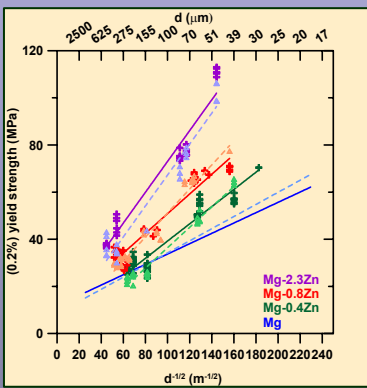
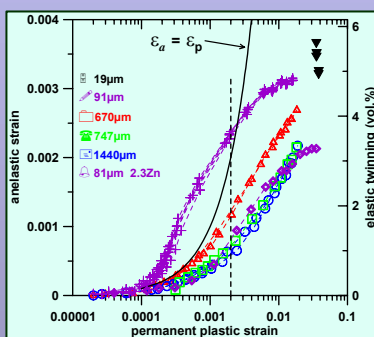
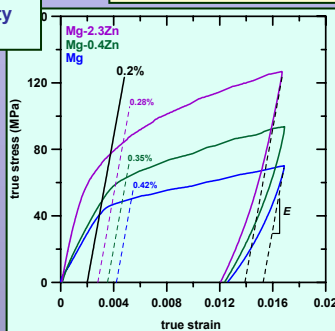
$$\sigma_y = \sigma_0 + k(s) d^{-1/2}$$



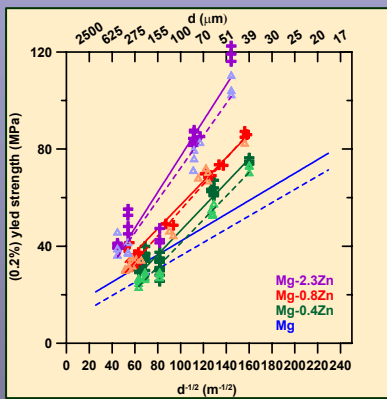
Flow curves pure Mg and alloy 2.3%atZn, different grain sizes



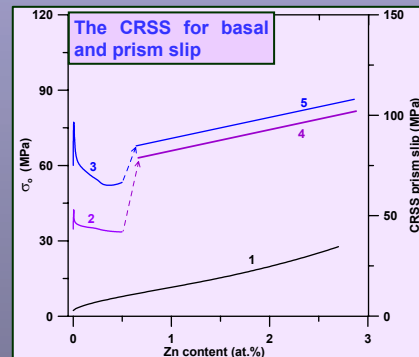
Pseudoelasticity effects



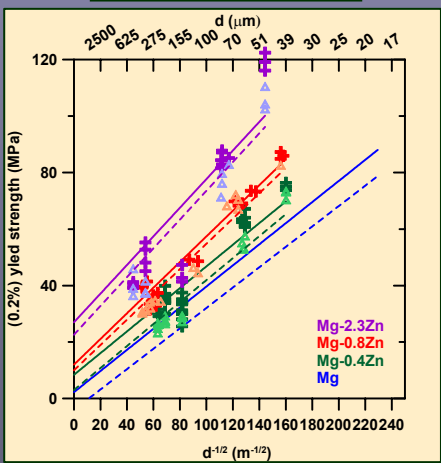
Ordinary H-P plot



HP- after correcting for pseudoelasticity



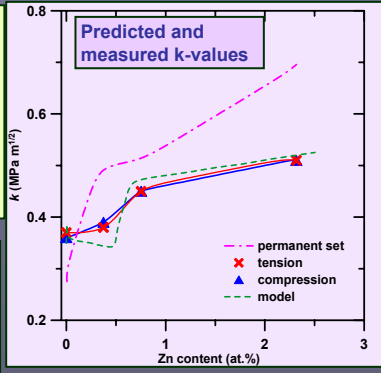
$$k = \alpha(\tau_p)^{1/2}$$



H-P plot with forced intercepts

$$\sigma_0 = M\tau_b = M(\tau_0 + \{ [B_r c^{2/3}]^2 + [B_s (c(1-c))^2] \}^{1/2})$$

|          | t/c asymmetry (MPa) | $\sigma_0$ (MPa) | $\sigma_0$ - t/c ass. (MPa) | k (MPa m <sup>1/2</sup> ) |
|----------|---------------------|------------------|-----------------------------|---------------------------|
| Mg       | T                   | --               | 2.2                         | 0.37                      |
|          | C                   | 6.3              | --                          | -4.1                      |
| Mg-0.4Zn | T                   | --               | 8.4                         | 0.38                      |
|          | C                   | 5.4              | --                          | 3.0                       |
| Mg-0.8Zn | T                   | --               | 12.0                        | 0.45                      |
|          | C                   | 2.0              | --                          | 10.0                      |
| Mg-2.3Zn | T                   | --               | 27.0                        | 0.51                      |
|          | C                   | 4.4              | --                          | 22.6                      |



## Conclusions

- After correcting the strength data for elastic and irreversible twinning effects, the Hall-Petch stress intensity factor increases in a stepwise fashion with the concentration of Zn.
- The stepwise increase is related to the development of short range order in the concentrated alloys.