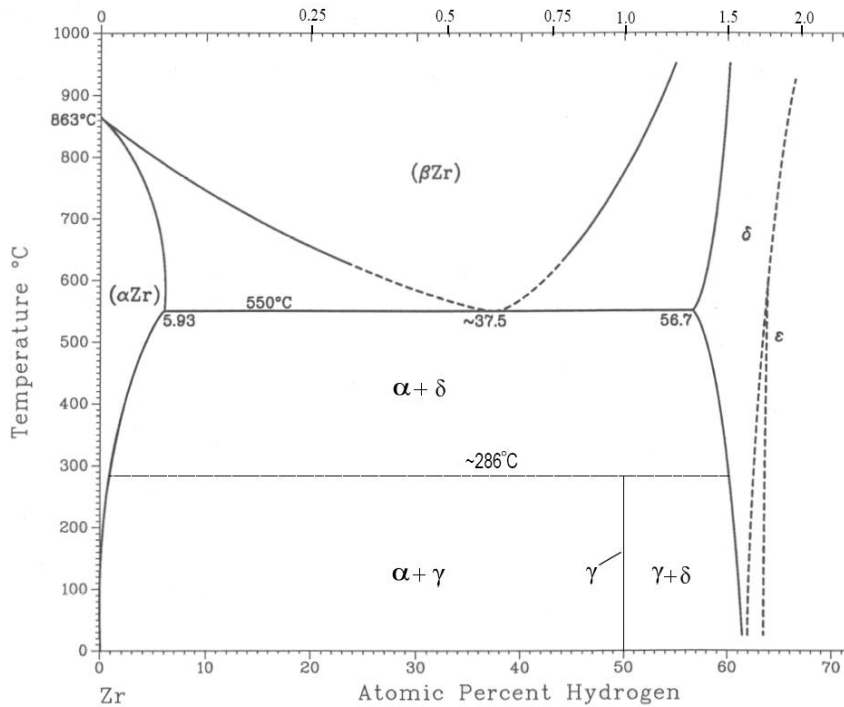


Titanium + Hydrogen Degradation

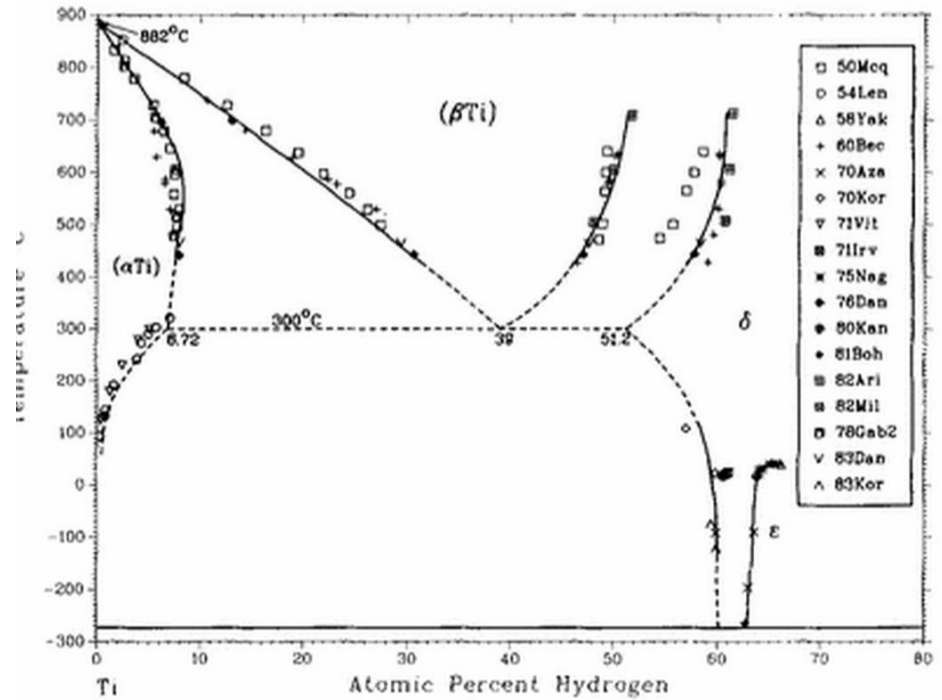
T.B. Britton

X-H Comparisons



Zr-H phase diagram

E. Zuzek, J.P. Abriata, A. San-Martin and F.D. Manchester *Bulletin of Alloy Phase Diagrams* (1990)

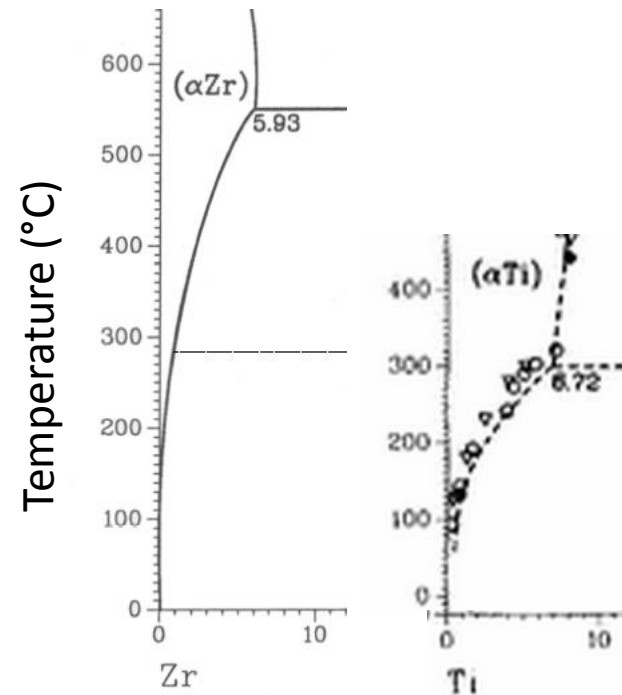


Ti-H phase diagram

A. San-Martin and F.D. Manchester *Bulletin of Alloy Phase Diagrams* (1987)

X-H Comparisons

- The solubility curve of [H] in Zr is very steep
 - Cooling to RT precipitates out hydrides
 - Brittle and reduces fracture toughness
- The solubility curve of [H] in Ti is less steep
- [H] also goes into the beta phase (BCC)¹
 - Fast diffusion and lots of sites
 - Leads to volumetric expansion (up to 5.4%)
- Likely to be fewer hydrides...



1. Tal-Gutelmacher and Eliezer – Hydrogen-Assisted Degradation of Titanium Based Alloys *Materials Transactions* (2004)