



D - détendu, *stress-relieved* α - recristallisé, *recrystallized* β - traité β, β

Morphologie des hydrures

morphology of hydrides

Fig. 1. Natural hydride distribution morphologies of Zircaloy-4 at six states.

3.2 Stress oriented hydride morphology

The tapered and smooth sheet specimens of six metallurgical states were prepared in the same way and then hydrided at 400°C under different tensile stresses.

To find quickly the threshold stress to change the hydride orientation, tapered specimens were used so as to obtain a stress gradient along the specimen axis. After hydriding, the specimen was examined by an image analysis system.¹¹ We can see the evolution of radial hydride (perpendicular to the stress) percentage along the axis of the specimen. The orientation of hydrides changes only when the tensile stress is higher than some value, called "lower thresh-

old" stress, σ'_{th} . Fully or near fully oriented hydrides can only be obtained in the very high stress region. This stress is denominated "upper threshold" stress, σ''_{th} . The radial hydrides were often longer than the grain thickness and they had to cut across GB rather than lying along them, especially for C1, S1 and S2. However, for C3 and S3 specimens, the morphology was more complicated. The hydrides can change their initial precipitation site to cross the interfaces but no universal orientation was observed.

The specimens issued from another fabrication route (super α) which have higher strengths than the specimens from the classical one were also studied. The hydride morphology

