

Margaux Saint Jalme
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 MATEIS (Damien Fabrègue, Sylvain Dancette)
 LGF (Christophe Desrayaud, Julien Favre)

Study of Titanium Alloys by Multiaxial Processing

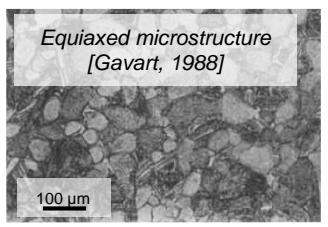
Context

Titanium alloys:

- TA6V(Ti 6%_wAl 4%_wV): α+β phases
 - $\rho \searrow R_m \nearrow$
- | | 58CW | TA6V |
|---------------------------------|------|------|
| <i>Acier inox martensitique</i> | | |
| Rm (N/mm ²) | 1100 | 1100 |
| ρ (g/cm ³) | 7.80 | 4.43 |

Multiaxial open-die forging:

- Reducing the section to obtain long product
- Obtaining an equiaxed microstructure with globularization of α phase



Aim:

- Improving our knowledge about globularization mechanism & kinetics during industrial process
- which involves complex strain path and interactions between globularization and recovery/recrystallization

Method and tools

Schenck servo-hydraulic machine:

- Uniaxial and plane-strain hot isothermal compression tests

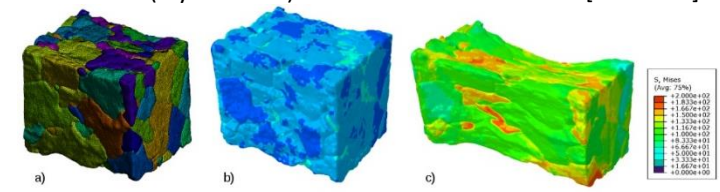
Gleeble MaxStrain:

- Physical simulation system
- Automatic cross forging of specimens under plane-strain compression with high reproducibility



Crystal plasticity:

- Renders the anisotropy of elementary deformation mechanisms (crystal scale) visible at the macro scale. [Dancette]



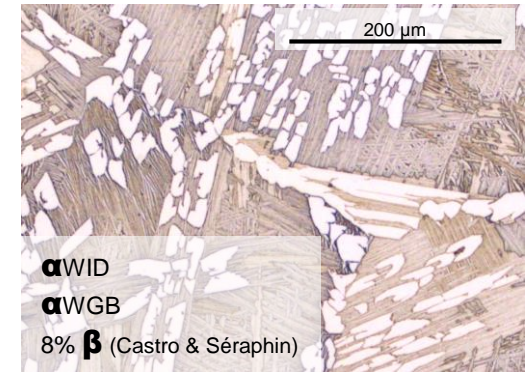
Crystal Plasticity Finite Element Method simulation of a tensile test. [Le Bourlot, 2017]

Other techniques :

- Microscopy (optical, SEM, TEM)
- Finite element modelling

Expected results

- **Constitutive law** of the flow stress for this two-phased alpha-beta titanium alloy



- **Experimental process** to take advantage of MaxStrain tests' temperature and strain gradients similar to the ones encountered in hot open-die forging of titanium alloys
- **Finite element model of microstructure evolution** during multiaxial forging with complex strain path