PERFE01 – Not regression of the homogenized calculation of type BZ of platform PERFECT

Summary:

This test makes it possible to validate the orders used by the platform PERFORM, which makes it possible to simulate the effects of irradiation on the components of engines. One is interested here in steel of tank.

One considers an element of volume to which one applies an imposed deformation. The material consists of a polycrystal with 30 single-crystal phases, homogenized by the method Berveiller-Zaoui (BZ).

Modeling A tests the constraints and average deformations obtained for an imposed deformation of 1% for a phenomenologic behavior.

Modeling B tests the constraints and average deformations obtained for an imposed deformation of 1% for a behavior DD_CC.

1 Problem of reference

1.1 Geometry

Not material.

1.2 Properties of single-crystal materials for modeling A

Elastic behavior with: Young modulus : $E=210\,000 MPa$
Poisson's ratio: $\nu=0.3$

Behavior single-crystal, with system of slip BCC24.

Type of flow: **MONO_VISC1** whose parameters are:
$n=12$, $K=15\,MPa$
Isotropic type of work hardening: **MONO_ISOT1** whose parameters are:
$R_0=175. MPa$
$b=30.$
$Q=20. MPa$
$\mathrm{H1}=0.1, \mathrm{H2}=0.7, \mathrm{H3}=\mathrm{H4}=0.1$ (interaction between systems of slip)
Kinematic Pas d' work hardening: $C=d=0$

1.3 Properties of single-crystal materials for modeling B

Young modulus: $E=(236-0{,}0459\,T)\ \mathrm{GPa}$ Poisson's ratio $\nu=0.35$
$\mathrm{TEMP}=183\,K$ $\mathrm{D\_LAT}=0{,}01$ $\mathrm{K\_BOLTZ}=8.62\ 10^{-5}$ $\mathrm{GAMMA0}=10^{-6} s^{-1}$ $\mathrm{TAU\_0}=363\,\mathrm{MPa}$ $\mathrm{TAU\_F}=0$ $\mathrm{RHO\_MOB}=10^{6}\ \mathrm{mm}^{-2}$ $\mathrm{K\_F}=75$ $\mathrm{K\_SELF}=100$ $\mathrm{B}=2.48\ 10^{-7}\mathrm{mm}$ $\mathrm{N}=50$ $\mathrm{DELTAG0}=0.84$ $\mathrm{D}=10^{-5}\mathrm{mm}$ $\mathrm{GH}=10^{11}$, $\mathrm{Y\_AT}=2\,10^{-6}\mathrm{mm}$, $\mathrm{RHO\_IRRA}=1.e8$, $\mathrm{a\_irr}=0{,}1$ The internal variables representing the density of dislocations are initialized with $\rho_0=13{,}10^{6}\,mm^{-2}$,

The matrix of interaction is built in both cases starting from the following values
$\mathrm{H1}=0.1024, \mathrm{H2}=0.7, \mathrm{H3}=\mathrm{H4}=\mathrm{H5}=\mathrm{H6}=0.1$
The family of systems of slip is cubic (CC).

1.4 Properties of the homogenized polycrystal

Behavior POLYCRYSTAL homogenized (method BZ) with 30 phases, whose directions are laid by:

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1.5 Boundary conditions and loadings

- Face $z=0$: $DZ=0$
- Face $y=0$: $DY=0$
- Face $x=0$: $DX=0$
- Face $z=1$: $DZ=f(t)$

The loading $f(t)$ is increasing linearly of 0 for $t=0$ with 0.1 pour $t=100\,s$
To decrease the computing time, this one is led until $t=20\,s$, that is to say a deformation imposed of $2\,\%$, in 2000 increments.

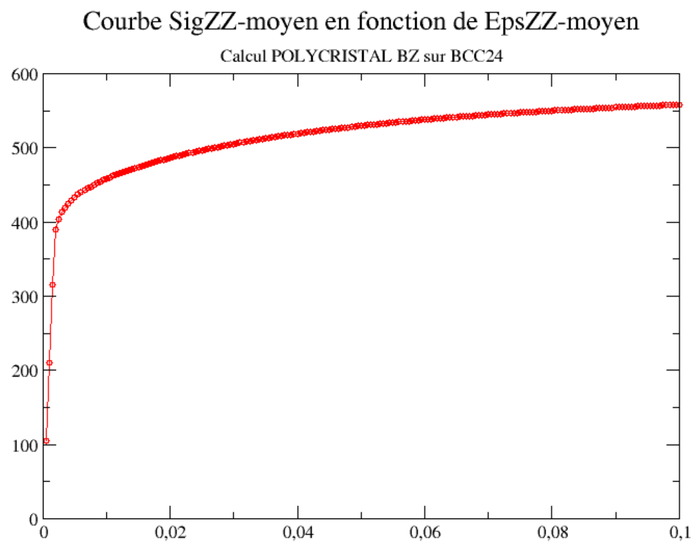
2 Reference solution

2.1 Method of calculating

The goal of this test is to check the validity of the command file used in PERFORM. The tests are thus of not-regression.

The values tested are the average constraints and average deformations according to Z at moment 10.

Note: by continuing calculation until $t=100\mathrm{s}$, the following traction diagram is obtained:



3 Modeling A

3.1 Characteristics of modeling

This calculation uses an integration clarifies (RUNGE_KUTTA), this is why one chooses a step of small time. The crystalline behavior is composed of MONO_VISC1 and MONO_ECRO1

3.2 Sizes tested and results

Results at the moment $10s$

Identification	Reference	*Aster*	$\%$ difference
σ_{zz} means	-	440,511	Not regression

4 Modeling B

4.1 Characteristics of modeling

This calculation uses an integration clarifies (RUNGE_KUTTA), this is why one chooses a step of small time. The crystalline behavior is MONO_DD_CC.

4.2 Sizes tested and results

Results at the moment $100s$

Identification	Reference	*Aster*	$\%$ difference
σ_{zz} means	-	764,156	Not regression

5 Summary of the results

Pas de particular comment, tests carried out being of nonregression.