# SSND109 - Cyclic loading on a monocrystal

**Summary:**

One presents here a test of traction and compression on a material point with the behavior MONOCRYSTAL . The family of systems of slip is octahedral.

Modeling A validates implicit integration and clarifies (Runge-Kutta) by comparison with the solution obtained using Zmat.

# 1 Problem of reference

## 1.1 Geometry

The geometry is that of a material point.

## 1.2 Material properties

Young modulus: $E=190000\,MPa$
Poisson's ratio: $\nu=0.3$

**Modeling a:**

MONO_VISC1: $N=10 \quad K=10 \quad C=100000$

MONO_ISOT1: $R_0=40 \;\; b=5 \;\; Q=0 \;\; H=0$

MONO_CINE1: $D=4150$

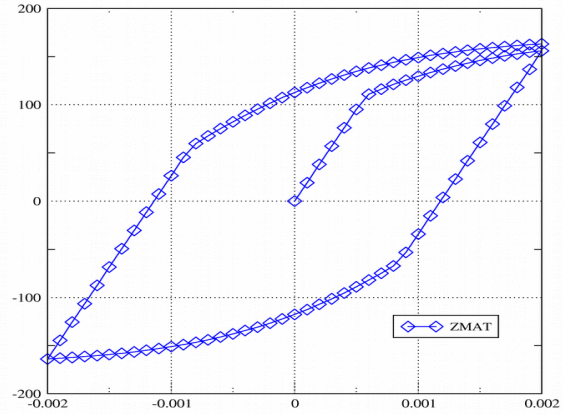
## 1.3 Boundary conditions and loadings

The loading consists of a cycle of deformation imposed according to $x$ :
with $t=0$ , $\varepsilon_{xx}=0$
with $t=0.5$ , $\varepsilon_{xx}=0.002$ ,
with $t=1.5$ , $\varepsilon_{xx}=-0.002$
with $t=2.5$ , $\varepsilon_{xx}=0.002$

# 2 Reference solution

It is the solution obtained with Zmat. The extreme points of the cycle are:

| INST | EPSILON_XX | SIG_XX_ZMAT |
|---|---|---|
| 5.00000E-01 | 2.00000E-03 | 1.56115E+02 |
| 1.50000E+00 | -2.00000E-03 | -1.63886E+02 |
| 2.50000E+00 | 2.00000E-03 | 1.63182E+02 |



# 3 Modeling A

## 3.1 Characteristics of modeling

Not material (use of SIMU_POINT_MAT). Two methods of resolution are tested:

- IMPLICIT
- RUNGE_KUTTA

## 3.2 Sizes tested and results

**Implicit integration**

| Identification | *Moment* | *Reference* | *Implicit aster* | % *difference* |
|---|---|---|---|---|
| $\sigma_{xx}$ | 0,5 | 156,115 | 156,115 | 0 |
| $\sigma_{xx}$ | 1,5 | -163,886 | -163,886 | 0 |
| $\sigma_{xx}$ | 2,5 | 163,182 | 163,182 | 0 |

**Integration clarifies (Runge-Kutta)**

| Identification | *Moment* | *Reference* | *Explicit aster* | % *difference* |
|---|---|---|---|---|
| $\sigma_{xx}$ | 0,5 | 156,115 | 156,211 | 0.1 |
| $\sigma_{xx}$ | 1,5 | -163,886 | -163,974 | 0.1 |
| $\sigma_{xx}$ | 2,5 | 163,182 | 163,281 | 0.1 |

# 4 Summary of the results

This test of not-regression makes it possible to validate by comparison with another software the behavior MONOCRYSTAL under cyclic loading.