

SSND113 - SIMU_POINT_MAT in great deformations, gradient of transformation imposed

Summary:

One compares, on a problem reduced to the material point, for a behavior `VISC_ISOT_TRAC` in great deformations of the type `SIMO_MIEHE`, the solution obtained by imposing a tensor of deformation with that obtained by imposing the gradient of transformation which corresponds. This test makes it possible to validate this functionality in `SIMU_POINT_MAT`

Modeling a: this modeling is used as reference, deformations imposed with `SIMU_POINT_MAT`.

Modeling b: this modeling uses a gradient of transformation imposed with `SIMU_POINT_MAT`.

1 Problem of reference

1.1 Geometry

It is about a material point, representative of a stress and strain state homogeneous.

1.2 Properties of material

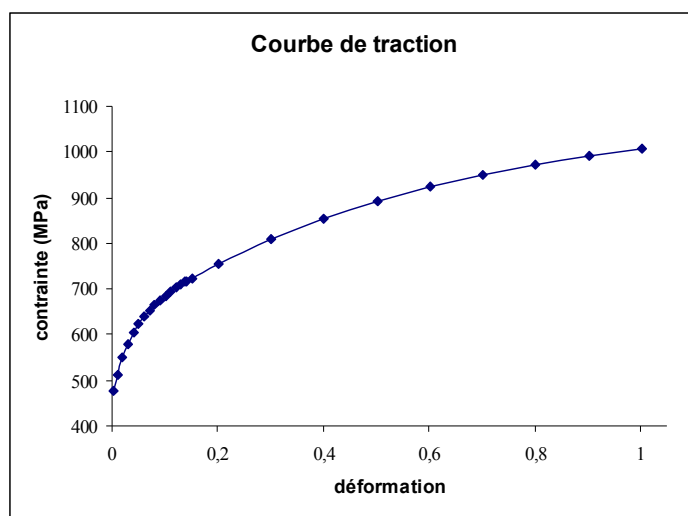
They result from test SSNL129 [V6.02.129]

Isotropic elasticity

Young modulus: $E = 215000$ MPa

Poisson's ratio: $\nu = 0.3$

Traction diagram (mod. With, B and C)



Coefficients for the viscous law $\sigma_0 = 6176$ MPa

VISC_SINH

$$\varepsilon_0 = 3.31131121483 \cdot 10^{13}$$

$$m = 6.76$$

1.3 Boundary conditions and loadings

The loading is in deformations imposed along the axis y , corresponding to speeds $\dot{\varepsilon}$ of $10^{-3} s^{-1}$

$$\varepsilon_{yy} = 0.2 \quad \text{for} \quad T = 2000 s, \quad \text{in 100 increments.}$$

All the other components of the deformation are worthless.

1.4 Initial conditions

Worthless constraints and deformations with $t = 0$.

2 Results of reference

Intercomparison enters two modelings A, and B, the behavior VISC_ISOT_TRAC in great deformations being validated in addition (SSNL129 for example).

3 Modeling A

3.1 Characteristics of modeling

Tensor deformation imposed on the material point, via the order SIMU_POINT_MAT.

$$\varepsilon_{yy} = 0.2 \frac{t}{2000}, \text{ in 100 increments. } \varepsilon_{xx} = \varepsilon_{zz} = 0, \quad \varepsilon_{xy} = \varepsilon_{xz} = \varepsilon_{yz} = 0$$

3.2 Sizes tested and results

3.2.1 Values tested

Variable	Moments (s)	Reference	Tolerance
σ_{yy} (MPa)	2000	5.98289E+02	0,01%
VI	2000	1.18814E-01	0,01%

4 Modeling B

4.1 Characteristics of modeling

Gradient of transformation imposed on the material point.

```
GRAD_IMPOSE= _F (F11=F2,  
                 F22=F1,  
                 F33=F2,  
                 F12=ZERO,  
                 F13=ZERO,  
                 F21=ZERO,  
                 F23=ZERO,  
                 F31=ZERO,  
                 F32=ZERO,
```

with $F1 = 1 + \varepsilon_{yy} = 1 + 0.2 \frac{t}{2000}$ $F2 = 1$.

4.2 Sizes tested and results

4.2.1 Values tested

Variable	Moments (s)	Reference	Tolerance
σ_{yy} (MPa)	2000	5.98289E+02	0,01%
V1	2000	1.18814E-01	0,01%

5 Summary of the results

The results are satisfactory and validate the operation of SIMU_POINT_MAT in great deformations with imposed gradient.