
SSND113 - SIMU_POINT_MAT in large deformations, gradient of transformation imposed

Summarized:

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

Modelization a: this modelization is used as reference, strains imposed with `SIMU_POINT_MAT`.

Modelization b: this modelization uses a gradient of transformation imposed with `SIMU_POINT_MAT`.

1 Problem of reference

1.1 Geometry

It acts of a material point, representative of a stress state and strains homogeneous.

1.2 Properties of the material

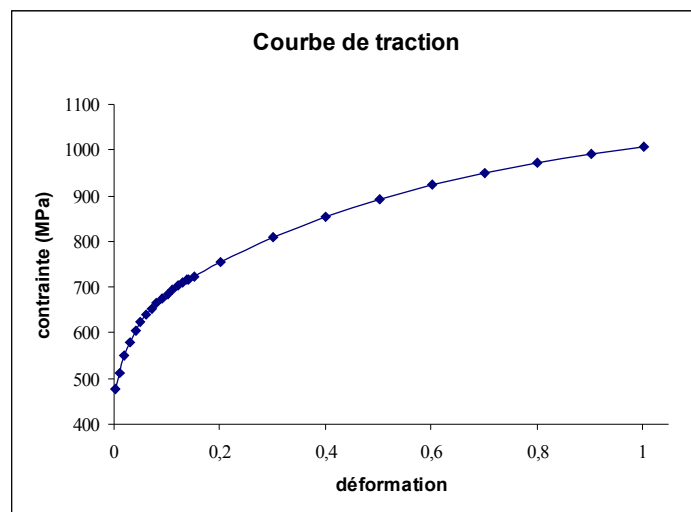
They result from test SSNL129 [V6.02.129]

isotropic Elasticity

Young Modulus: $E = 215000$ MPa

Poisson's ratio: $\nu = 0.3$

Curve of tension (mod. A, B and C)



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

VISC_SINH

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

$m = 6.76$

1.3 Boundary conditions and loadings

the loading is in strains imposed along the axis y , corresponding to velocities $\dot{\varepsilon}$ of $10^{-3} s^{-1}$
 $\varepsilon_{yy} = 0.2$ for $T = 2000 s$, in 100 increments.

All the other components of the strain are null.

1.4 Forced

initial conditions and null strains with $t = 0$.

2 Results of reference

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

3 Modelization A

3.1 Characteristic of the modelization

Tensor strain imposed on the material point, via command 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 Quantities tested and Values

3.2.1 results tested

Variable	Times (s)	Reference	Tolerance
σ_{yy} (MPa)	2000	5.98289E+02	0.01%
VI	2000	1.18814E-01	0.01%

4 Modelization B

4.1 Characteristic of the modelization

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 Quantities tested and Values

4.2.1 results tested

Variable	Times (s)	Reference	Tolerance
σ_{yy} (MPa)	2000	5.98289E+02	0.01%
VI	2000	1.18814E-01	0.01%

5 Summary of the results

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