Code_Aster

Titre : Opérateur POST_BORDET
Responsable : Renaud BARGELLINI

Version default

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Operator POST_BORDET

1 Drank

the object of this command is to calculate, in postprocessing of a computation of nonlinear mechanics elastoplastic, the probability of cleavage from the model from Bordet as well as the stress from the model from the same name.

This command initially calculates the mechanical fields necessary to the postprocessing and from of deduced the stress from Bordet and finally the associated probability.

It turns over an array containing:

*   the stress of Bordet according to time (with key word `SIG_BORDET`)
*   the probability of Bordet according to time (with key word `PROBA_BORDET`)

the macro-command functions in `D_PLAN`, `AXIS` or in `3D`.

The model of Bordet is described in detail in documentation of reference [R7.02.06].
Advice of use of this model is given in documentation [U2.05.08].

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2   Syntax

```
        [array]    = POST_BORDET (
        ♦ RESULTAT=resumeca            ,                    [result]
        ♦ /TOUT        =     ' OUI',
          /GROUP_MA    =   group_ma,                        [l_group_ma]

        ♦ /INST        =instant  ,                    [R]
          /NUME_ORDRE  =ordre                          [I]
        ◊ /PRECISION   = \ 1E-06                        [DEFAULT]
                          \ prec,                       [R]
        ◊ /CRITERE     = ' ABSOLU'                      [DEFAULT]
                         "RELATIF",

        ◊ PROBA_NUCL=/           "NON                   [DEFAULT]
                     /"OUI'

    #Si PROBA_NUCL=' NON":
        ♦   PARAM= _F          (
            ♦ M=m              ,                    [R]
            ♦ SIGM_REFE=sigma_ref       ,              [function]
            ♦ VOLU_REFE=r_sup       ,                  [R]
            ♦ SIG_CRIT=sigma_crit      ,               [R]
            ♦ SEUIL_REFE=lim_elas_ref    ,             [R]
            ♦ SEUIL_CALC=lim_elas   ,                          [function,
three-dimensions function]
                ),


    #Si PROBA_NUCL=' OUI':
        ♦   PARAM= _F          (
            ♦ M=m              ,                    [R]
            ♦ SIGM_REFE=sigma_ref       ,              [function]
            ♦ VOLU_REFE=r_sup       ,                  [R]
            ♦ SIG_CRIT=sigma_crit      ,               [R]
            ♦ SEUIL_REFE=lim_elas_ref    ,             [R]
            ♦ SEUIL_CALC=lim_elas   ,                          [function,
three-dimensions function]
            ♦ DEF_PLAS_REFE=lim_elas    ,                  [R]
                ),

        ♦ TEMP=temperature       ,                  [R,  function]


        ◊ COEF_MULT=    \ 1,                        [DEFAULT]
                        \ coefficient,              [R]

    )
```

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3 Operands

3.1 Operand RESULTAT

Indicates result thermomechanical computation for which one calculates the quantities of Bordet. Data structure RESULTAT provided must comprise one and only one model and one and only one field material.

3.2 Operand TOUT/GROUP_MA

```
♦   /TOUT       =    ' OUI',
    /GROUP_MA   =    group_ma,                          [l_group_ma]
```

Indicates the field of the model on which the computation of the quantities of Bordet will be carried out. By default, it is carried out on the group of the model. Let us note that like the model utilized variation of the plastic strain, the mesh group on which computation is carried out must contain *has minimum* all the field on which the plastic strain evolved during the loading, and that to take a larger field will not change result (but period of computation).

3.3 =instant operand

```
    INST/NUMÉRIQUE_ORDRE  ♦    /INST ,                          [R]

    /NUME_ORDRE  =ordre                                     [I]
```

The computation will be carried out for all times or sequence number until time or sequence number indicated by this operand.
Result will be an array containing various times of computation, the stress and the probability of Bordet.

3.4 Operand accuracy

```
◊  /PRECISION   =  \ 1E-06                         [DEFAULT]
                   \ prec,                          [R]
```

Makes it possible to define, in the case of the use of the key word INST, an accuracy in the search of the last time of computation of the quantities of Bordet. If the accuracy is not defined by the user, an accuracy of 1E-06 is applied.
If the time required by the user does not correspond with any interval [time-PREC; instant+prec] saved as a result, computation stops in fatal error.

3.5 Operand CRITERE

```
◊  /CRITERE  = ' ABSOLU'                           [DEFAULT]
               "RELATIF",
```

Allows to define, in the case of the use of the key keys INST and accuracy, if the accuracy is absolute or relative. By default, it is absolute.

3.6 Operand PROBA_NUCL

```
◊  PROBA_NUCL=/           "NON                     [DEFAULT]
                /"OUI'
```

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Indicates if the user wishes to take into account the exponential term in his computation. This term, as higher specified, is of negligible influence if $\dfrac{\sigma_{ys,0} \varepsilon_{p,0}}{\sigma_{ys}(T, \dot{\varepsilon}_p)} \gg \varepsilon_p$. If the user wishes to take into account this term, it must then inform an additional parameter which is the equivalent plastic strain of reference. If not, this parameter is useless.

3.7 Operand PARAM

```
♦    PARAM=_F            (
          ♦  M=m                 ,                        [R]
          ♦  SIGM_REFE=sigma_ref         ,               [function]
          ♦  VOLU_REFE=r_sup         ,                     [R]
          ♦  SIG_CRIT=sigma_crit         ,                [R]
          ♦  SEUIL_REFE=lim_elas_ref     ,               [R]
          ♦  SEUIL_CALC=lim_elas    ,                       [function,
three-dimensions function]
          ♦  DEF_PLAS_REFE=lim_elas      ,                [R]
          ),
```

Indicates all the material parameters necessary to the computation of the quantities of the model of Bordet. Three first have equivalents in the model of Beremin (with values which can vary from one model to another), the four following being specific with the model of Bordet.

3.7.1 Key word M

♦ M=m   ,   [R]

Appoints the exhibitor m of the model of the Weibull type (sometimes called factor of form).
Caution: this quantity is not inevitably equal to its equivalent in the model of Beremin.

3.7.2 Key word SIGM_REFE

♦ SIGM_REFE=sigma_ref   ,   [function]

Indicates the stress of reference $\sigma_u(T)$ of the model of the type of Weibull (sometimes called scale factor). It is the stress for which the probability of cumulated fracture of the potential sites of cleavage is worth 1.
This stress depends on the temperature; a function of the temperature here is expected.
Caution: this quantity is not inevitably equal to its equivalent in the model of Beremin.

3.7.3 Key word VOLU_REFE

♦   VOLU_REFE=V0   [R]

Indicates the elementary volume of reference V_0 of the plastic zone.
Caution: this quantity is not inevitably equal to its equivalent in the model of Beremin.

3.7.4 Key word SIG_CRIT

♦   SIG_CRIT=sigma_crit   ,   [R]

Indicates the critical stress σ_{th} below which the propagation of the ferritic microscopic cracks cannot be significant; so $\sigma_1 < \sigma_{th}$ in any point, then necessarily $P_{Bordet} = 0$.

3.7.5 Key word SEUIL_REFE

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♦ SEUIL_REFE=lim_elas_ref , [R]

Indicates the yield stress $\sigma_{ys,0}$ with a reference temperature to be used in the model.

3.7.6 Key word SEUIL_CALC

♦ SEUIL_CALC=lim_elas , [function, three-dimensions function]

Indicates the yield stress of the material $\sigma_{ys}\left(T,\dot{\varepsilon}_p\right)$, which in any rigor depends on the temperature and the plastic strainrate.
If one does not know the dependence at the plastic strainrate, one can use for SEUIL_CALC a simple function of the temperature.
If one knows the dependence at the same time with the temperature and the plastic strainrate, one can define a three-dimensions function; the parameter of the three-dimensions function must be the plastic strainrate, and the variable for each function the temperature (cf document user of DEFI_NAPPE)

Example:

```
SIGY1=DEFI_FONCTION (NOM_PARA=' TEMP",
                VALE= (0. , 200. , 100. , 200. ,),
                PROL_DROITE=' CONSTANT', PROL_GAUCHE=' CONSTANT',);

SIGY2=DEFI_FONCTION (NOM_PARA=' TEMP',
                VALE= (0. , 300. , 100. , 300. ,),
                PROL_DROITE=' CONSTANT', PROL_GAUCHE=' CONSTANT',);

SIGY=DEFI_NAPPE (NOM_PARA=' EPSI',
            PROL_DROITE=' CONSTANT', PROL_GAUCHE=' CONSTANT',
            PARA= (0.0005, 0.001),
            FONCTION= (SIGY1, SIGY2),);

CALC_BORDET (..... SEUIL_CALC=SIGY,…);
```

3.7.7 Key word DEF_PLAS_REFE

♦ DEF_PLAS_REFE=lim_elas , [R]

This key word is compulsory if PROBA_NUCL=' OUI' and PROHIBITED if PROBA_NUCL=' NON'.
It indicates the equivalent plastic strain of reference $\varepsilon_{p,0}$ which intervenes only in the exponential term.

3.8 Operand TEMP

♦ TEMP=temperature , [R, function]

As specified in the foregoing paragraphs, certain material parameters depend on the temperature. TEMP indicates the temperature, considered uniform for time on the zone of computation of Bordet. The user can inform a reality, in which case the temperature is considered uniform spaces some and time-constant, or a function of time, in which case the temperature is considered uniform spaces some but evolutionary in time.

3.9 Operand COEF_MULT

◊ COEF_MULT= \ 1, [DEFAULT]
\ coefficient, [R]

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the default value of this coefficient is `1.0`.

The following table, in which the thickness is noted e, indicates typical values of the coefficient C according to the type of symmetry:

- **simple symmetry** : the symmetry plane of the mesh passes by the plane of the default and the default is entirely with a grid,
- **double symmetry** : the symmetry plane of the mesh also passes by the plane of the default but only one half of the default is with a grid.

	3D **and** 3D_SI	AXIS **and** AXIS_SI	D_PLAN **and** SIMPLE	D_PLAN_SI
C_PLAN	2	4π	2nd	2nd
DOUBLE	4	without object	without object	without object
NON	1	2π	E	E

Table 3.9-1: Values of the multiplying coefficient of symmetry-thickness

4   Example of use

One will find examples in the elementary case test zzzz268 and the case test ssna108a.
Advice of use of this model is given in documentation [U2.05.08].