ABOUT THE RELATIONSHIPS STRUCTURE-DEFORMATION OF DAMAGED INITIALLY "ISOTROPIC" COMPOSITES

Jamal RHARBAL, Fellowship and Jacques RACLIN, Professor

Université de Bourgogne, UFRST-Dépt. IEM
6, bd. Gabriel
F-21000 DIJON

ABSTRACT

Our proposed work is a mechanical approach of the constitutive anisotropic relations for initially "isotropic" composites in a natural state of stability regarding to their actual internal oriented structure. Under sollicitations (induced deformation) these solids show usually a stated degree of directionnality in their behaviours whilst occurs a rearrangement of the structure in the damaged and deformed state regarding to the process of set formation.

The relationship structure-deformation is considered under the form of a tensorial relation based on the theory of representation for a tensorial anisotropic functions. The sollicitations (here **T**-stress tensor) is considered, in this manner, as a 2-order tensorial isotropic function of not only the response (kinematic **D**-tensor) but also of two others tensors, namely a tensor of structure and a tensor of "damage", $\mathbf{E} \otimes \mathbf{E}$-tensor as well (the damage is characterized by the 1-order **E**-tensor). Theses tensors are 2-order tensors.

From this relation we can obtain a generalization of the "damage" effect for a initially "isotropic" solid. The damage **E**-tensor induces under the deformation an anisotropy of the structure. The **T**-constitutive law is a tensorial anisotropic function regarding the **E**-argument.

We present in short some particular examples displaying the advantage of our law :

1. The **E**-tensor is a 0-order tensor. **E** is a scalar : this hypothesis is more often carried in the Engineering Science. From our law, we can obtain similar results.
2. The **E**-tensor is a 1-order tensor : unidirectional and bidirectional damages are presented.