Mechanics of Materials 14 (1993) 313–315
Elsevier

Errata

Effects of grain boundary sliding ... *Mech. Mater. 11*, 43–62

and

Modeling of creep damage evolution ... *Mech. Mater. 11*, 19–42

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Received 15 September 1992

1. Effects of grain boundary sliding on creep-constrained boundary cavitation and creep deformation

In the paper mentioned above, the following corrections should be made:

(1) The definition of the grain boundary facet crack density parameter, ρ, for the plane strain hexagonal grains on page 46, line 2 of the first column should be $\rho = (3\pi/2)N_{\text{hex}}R^2$, where N_{hex} is number of facet cracks per unit area. To distinguish this particular microcrack density parameter for the plane strain configuration from a more general definition in the following, we denote this one by ρ_{hex}. Therefore, the expression in line 12 becomes $\rho_{\text{hex}} = (3\pi/2)R^2/(m_1 m_2 A_G)$. Then Eq. (12) becomes:

$$\frac{J}{\sigma_e^\infty \dot{\epsilon}_e^\infty R} = h_2\left(n, \frac{S}{\sigma_e^\infty}, \rho_{\text{hex}}\right) \approx H_0(n, \rho_{\text{hex}}) + H_1(n, \rho_{\text{hex}})\left(\frac{S}{\sigma_e^\infty}\right) + H_2(n, \rho_{\text{hex}})\left(\frac{S}{\sigma_e^\infty}\right)^2, \tag{12a}$$

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where

$$H_0(n, \rho_{\text{hex}}) = (1.399 + 2.909\rho_{\text{hex}})n^{0.5838 - 3.636\rho_{\text{hex}}} \tag{12b}$$

$$H_1(n, \rho_{\text{hex}}) = (2.699 + 32.80\rho_{\text{hex}}) + (1.732 + 2.527\rho_{\text{hex}})n \tag{12c}$$

$$H_2(n, \rho_{\text{hex}}) = (3.006 - 61.16\rho_{\text{hex}}) + (1.054 + 38.94\rho_{\text{hex}})n, \tag{12d}$$

where, again, $\rho_{\text{hex}} = (3\pi/2)N_{\text{hex}}R^2$.

To generalize the plane strain finite-element results to a 3-D grain structure, two tasks need to be addressed. First, the equivalence between 2-D and 3-D configurations should be addressed, i.e., a facet crack density parameter, ρ, should be defined which is applicable to both 2-D and 3-D cases; second, the conversion between the 2-D and 3-D results in the limiting case as ρ approaches zero should be considered. The second task has been addressed in Section 4 of the paper by utilizing the perturbation solutions by He and Hutchinson (1981), resulting in the conversion factors $f_1(n)$ and $f_2(n)$ given in Eqs. (13) and (14). The first task, however, was not addressed sufficiently clearly in the paper.

Here we adopt the facet crack density parameter ρ, first proposed by Budiansky and O'Connell (1976) and recently modified by Dib and Rodin (1992), defined as

$$\rho = \frac{2}{\pi V} \sum_{i=1}^{N} \frac{A_i^2}{L_i}, \tag{C1}$$

where V is the volume containing N facet cracks, and A_i and L_i are the area and perimeter, respectively, of the ith facet crack. This definition provides a unified measure of crack density for both 2-D and 3-D configurations.

To establish the relation between ρ_{hex} and ρ defined in (C1), we consider the special case of 2-D array of hexagonal grains with one facet crack per grain. It is shown in the Appendix that in this case, $\rho_{\text{hex}} = 3.702\rho$. Thus, more generally, the expressions in Eq. (12) can be rewritten by replacing "ρ_{hex}" with "3.702ρ".

(2) In Section 5.2, on page 56, the crack density parameter in 3-D case was defined as $\rho = N_f R^3$, where N_f is the number of facet cracks per unit volume, and R is the equivalent radius of a facet crack. It can be easily shown that this definition yields a value of ρ identical to that obtained from (C1) for a cylindrical grain with a circular crack. Therefore, the symbol ρ can be retained in Sections 4 and 5 in the paper, but ρ is more generally defined by (C1). Accordingly, in Eq. (24a,b) the quantity $N_f R^3$ should be replaced by ρ.

(3) In the subsequent equations, (25–29) and (31), the crack density parameter ρ in functions H_0, H_1 and H_2 should be changed to ρ_{hex} (the plane strain crack density parameter). As a result, Figs. 13 and 15 have required replotting. The corrected figures are given below.

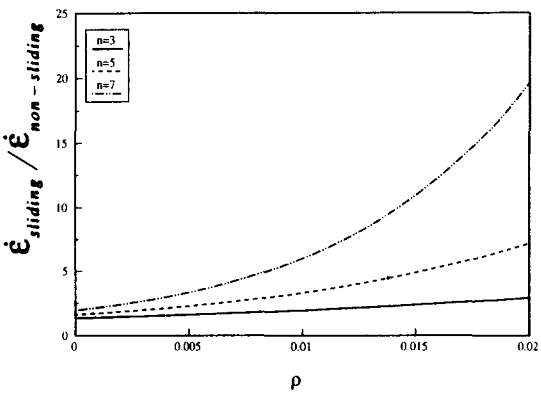

Fig. 13. Effect of G–B sliding on uniaxial creep strain as a function of facet crack density ρ, for three creep stress exponents.

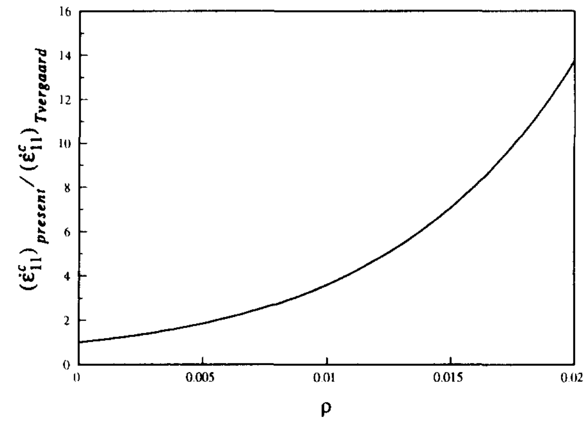

Fig. 15. Comparison of predictions of present model for uniaxial tensile strain rate with results of Tvergaard ($n = 5$, $\gamma = 0.5$, $C_1 = 1$, and $C_2 = 4$) as a function of crack density ρ, for vanishing facet stress ($\sigma_F = 0$ in Tvergaard's model).

2. Modeling of creep damage evolution around blunt notches and sharp cracks

In the paper mentioned above the following corrections should be made:

(1) In Section 3.3 on page 26, the functions $H_0(n,\rho)$, $H_1(n,\rho)$ and $H_2(n,\rho)$ should be changed to $H_0(n,\rho_{\text{hex}})$, $H_1(n,\rho_{\text{hex}})$ and $H_2(n,\rho_{\text{hex}})$, where $\rho_{\text{hex}} = 3.702\rho$ and ρ is defined in (C1).

(2) The figure captions in Figs. 7, 8, 13, and 14 are affected by this change. They should be respectively corrected as:

(i) Fig. 7: contour No./damage level: 1/0.003; 2/0.043; 3/0.082; 4/0.121; 5/0.161; 6/0.200;
(ii) Fig. 8: contour No./damage level: 1/0.0003; 2/0.040; 3/0.080; 4/0.120; 5/0.160; 6/0.200;
(iii) Figs. 13, 14: contour No./damage level: 1/0.002; 2/0.051; 3/0.101; 4/0.150; 5/0.200.