A note on the multiaxial secondary creep behaviour of anisotropic materials(**)

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THE PRESENT model is based on the assumption of existence of a creep potential. The anisotropic secondary creep behaviour of incompressible material is described by applying the stress mapping tensor $\boldsymbol{\beta}'$. BETTEN (1981), as the fourth rank tensor, adapted previously by SOBOTKA (1976) and BOEHLER, SAWCZUK (1977) in the theory of plasticity of anisotropic materials. Assuming a linear representation, tensor $\boldsymbol{\beta}'$ transforms anisotropic stress state $\boldsymbol{\sigma}'$ of actual material into equivalent isotropic stress state $\boldsymbol{\tau}'$ of fictitious material

$$\tau'_{ij} \equiv \beta'_{ijpq}\sigma'_{pq},$$

where τ'_{ij} and σ'_{pq} are deviators of the stress tensor and $\beta'_{ijpq} \equiv \beta_{ijpq}-(1/3)\beta_{kkpq}\delta_{ij}$.

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The theory of a creep potential is based on the principle of maximum dissipation rate, from which, following Lagrange's method in connection with a creep condition, one derives the flow rule of fictitious material.

To relate theory to the experiment, a simplified approach was assumed for orthotropic and incompressible material, where

$$\beta'_{ijpq} \equiv \frac{1}{2}(\omega_{ip}\omega_{jq}+\omega_{iq}\omega_{jp})-\frac{1}{3}\omega^2_{pq}\delta_{ij}.$$

To determine principal components $\omega_{\rm I}$, $\omega_{\rm II}$, $\omega_{\rm III}$ and principal directions n'_i, n''_i, n'''_i $(i = 1, 2, 3)$ of the tensor ω_{ij}, three basic tests are required, i.e. experiments carried out on thin-walled tubular specimens subjected to the uniaxial tension, pure torsion and internal pressure.

Then the surfaces of constant steady-state creep rate were appointed and verified by combined tension-torsion tests performed on the tubular specimens, ODING (1959) and KOWALEWSKI (1987).

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