

CREEP OF METALS UNDER MULTIAXIAL STATES OF STRESS

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The theory of constitutive relations in creep is reviewed, with primary emphasis on metals. In metals, most of the creep deformation is irreversible, and in addition, dependency of creep rate on stress is very non-linear. Consequently, linear viscoelasticity theory (hereditary elasticity) does not predict creep in metals accurately. Accordingly creep theories in metals are often based upon assumptions only partially confirmed by experiments. Often creep theories of metals are based upon constitutive relations for constant stress, constant temperature creep data. For variable stress and temperature processes, a hardening rule is required. In addition, a flow criterion is needed for multiaxial states of stress. In this lecture, various strain hardening and flow criteria are considered. The applicability of these criteria are reviewed and comparisons with experimental evidence are made whenever possible. Suggestions for a rational approach to creep of metals under multiaxial stress states are given.