Outline

- True stress – true strain
- Critical resolved shear stress
- Grain size vs. strength
- Composites
- Fracture mechanics
- Cold working

Example 1

A metal is deformed in a tension test into its plastic region. The starting specimen had a gage length = 2.0 in and an area = 0.50 in². At one point in the tensile test, the gage length = 2.5 in and the corresponding engineering stress = 24,000 lb/in²; and at another point in the test prior to necking, the gage length = 3.2 in and the corresponding engineering stress = 28,000 lb/in². Determine the strength coefficient and the strain hardening exponent for this metal.

Example 2

Consider a single crystal of silver oriented such that a tensile stress is applied along a [001] direction. If slip occurs on a (111) plane and in a [101] direction, and is initiated at an applied tensile stress of 1.1 MPa (160 psi), compute the critical resolved shear stress.

Example 3

The lower yield point for an iron that has an average grain diameter of 5×10^{-2} mm is 135 MPa. At a grain diameter of 8×10^{-3} mm, the yield point increases to 260 MPa. At what grain diameter will the lower yield point be 205 MPa?

Example 4

It is desired to fabricate a continuous and aligned glass fiber-reinforced polyester having a tensile strength of at least 1400 MPa in the longitudinal direction. The maximum possible specific gravity is 1.65. Using the following data, determine if such a composite is possible. Justify your decision. Assume a value of 15 MPa for the stress on the matrix at fiber failure.

|	*Specific Gravity*	Tensile Strength *[MPa]*
Glass fiber	2.50	3,500
Polyester	1.35	50

Example 5

A specimen of a ceramic material having a modulus of elasticity of 250 GPa is pulled in tension with a stress of 750 MPa. Will the specimen fail if its ''most severe flaw'' is an internal crack that has a length of 0.20 mm and a tip radius of curvature of 0.001 mm? Why or why not?
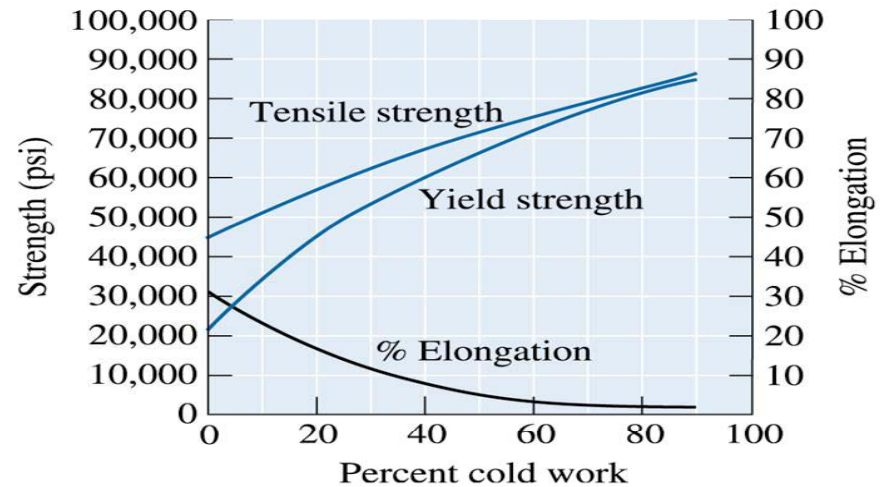
Example 6

A 1 cm thick copper plate is cold reduced to 0.50 cm, and later further reduced to 0.16 cm. Determine the total percent cold work and the tensile strength of the 0.16 cm.
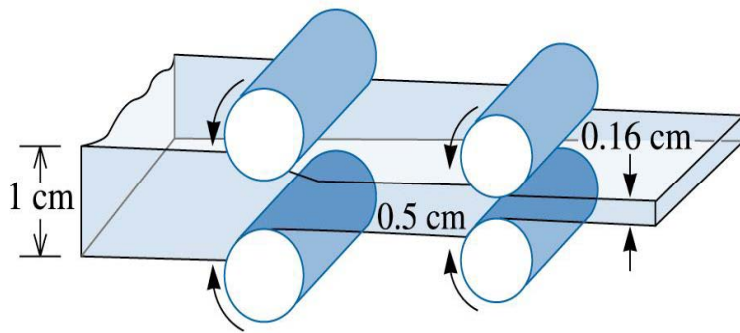
Page 324 - Askeland

Next time:
Midterm Exam

Next topic:
Corrosion