



Professional English of Material Chemistry

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Unit 3

Structure-Property Relationships of Materials



New Words and Expressions



Stress

Strain

Gauge

Datum data

Indentor

Stiffness

Strength

Ductility

Hardness

nucleation

Toughness

Shaft

Debris

Swing

Crumple

Kintic

Braze

Eutectic

Spray

boride





- **Tensile test** 拉伸试验
- **Sample** 试样
- **Elongation** 伸长
- **Cross-sectional** 短剖面
- **Deforming** 扭屈
- **Elastic modulus** 弹性模量
- **Young's modulus** 杨氏模量
- **Spring** 弹簧，发条
- **Criterion** 标准



- **Yield stress** 屈服应力
- **Work hardening** 加工硬化
- **Strain hardening** 应力硬化
- **Ultimate tensile stress** 拉伸强度极限
- **Neck** 颈缩
- **Abrasion** 磨蚀
- **Concrete** 混凝土
- **Guard rail** 护栏
- **Halt** 止步不前



- **Fatigue** 疲劳
- **Creep** 蠕变
- **Substrate** 基体
- **Conventional means** 常规方法
- **Melt spinning** 熔体（熔融）纺丝
- **Foil** 箔
- **Precipitate** 沉积



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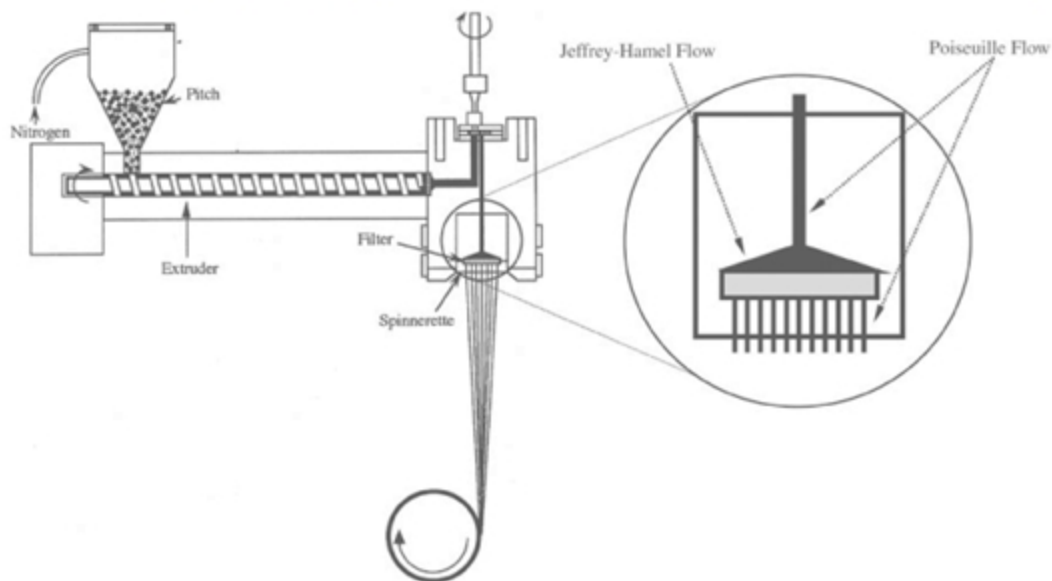


Figure 2. Processing sequence of mesophase carbon fibers. Adapted from McHugh⁶.

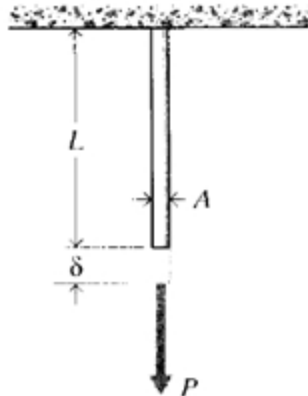


图 1 拉伸试验

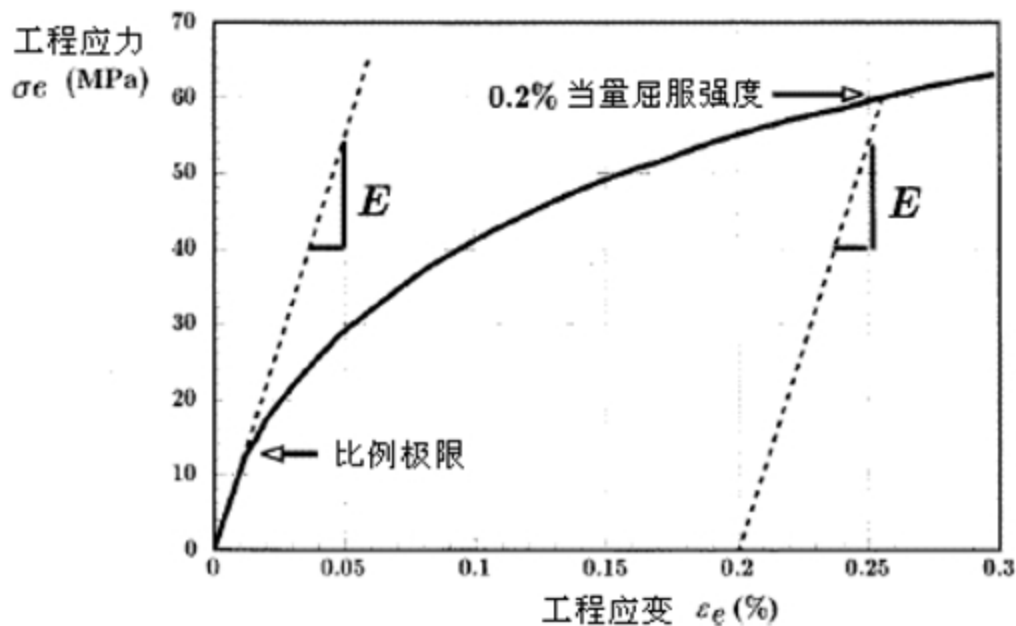


图 2 退火的多晶体铜在小应变区的工程应力-应变曲线
(在许多塑性金属中, 这一曲线具有典型性)

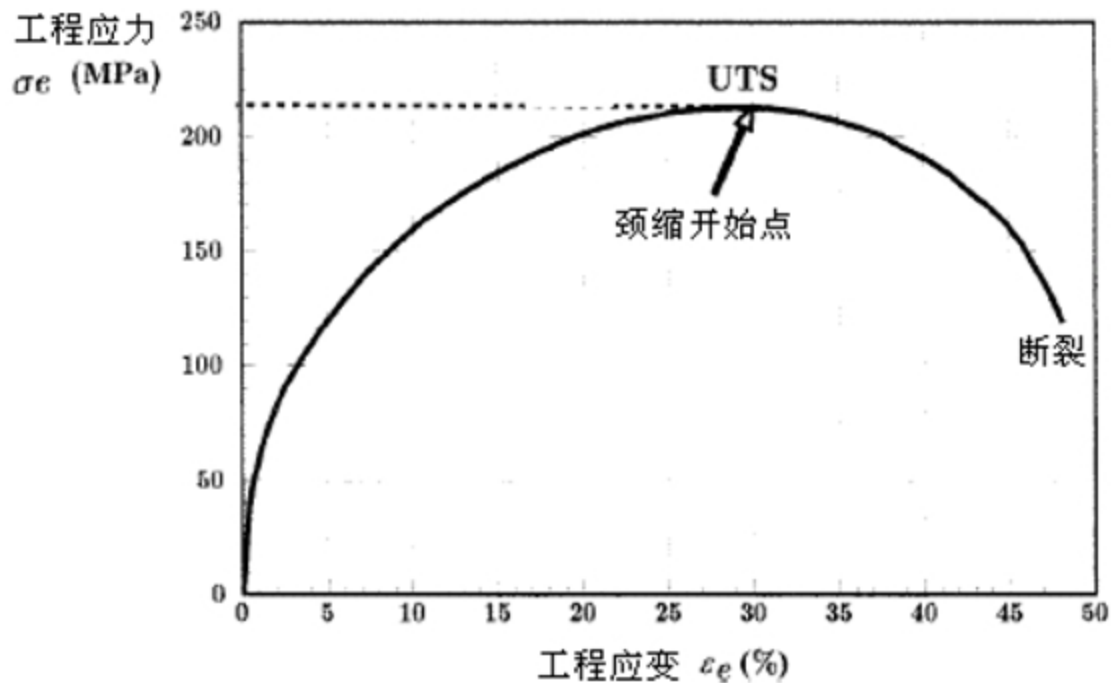


图 3 退火的多晶体铜完整的工程应力-应变曲线



图 4 拉伸试样的颈缩

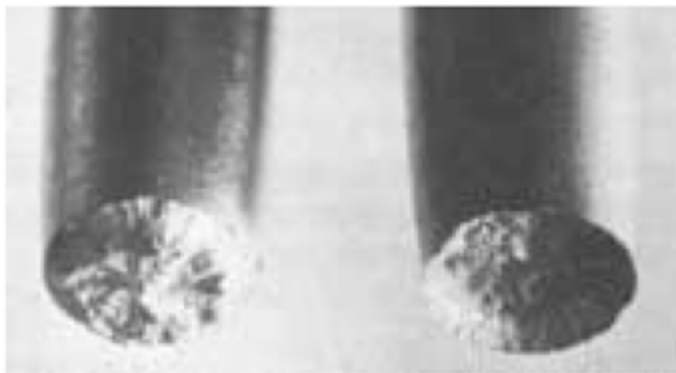


图 5 塑性金属的锥杯状断裂

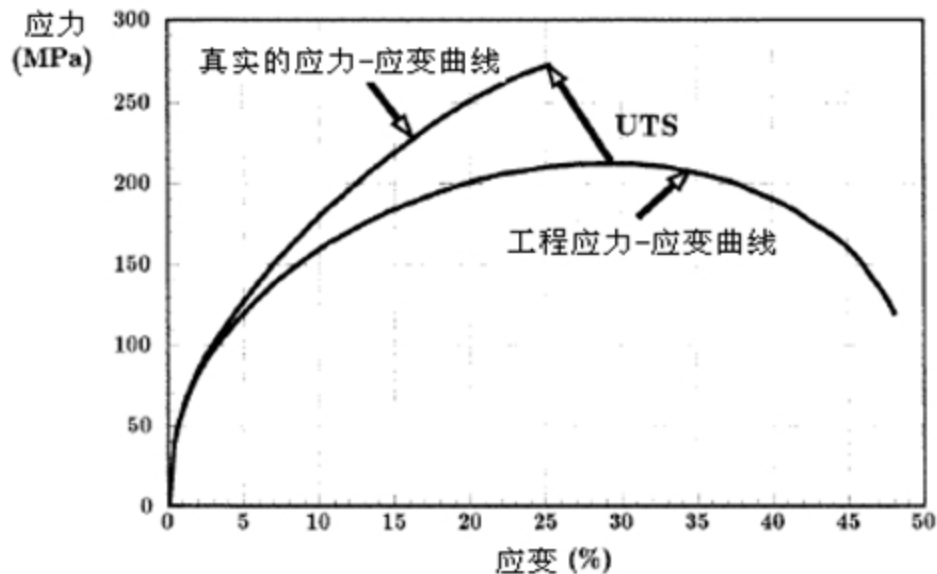


图8 铜的工程应力-应变曲线与真实的应力-应变曲线的比较。箭头指出了工程曲线上的UTS（拉伸强度极限）在“真实”曲线上的位置。

表 1 不同材料吸收能量的性能

材料名称	最大应变 (%)	最大应力 (MPa)	韧性模量 (MJ/m ³)	密度 (kg/m ³)	所吸收能量的 最大值 (J/kg)
生铁	0.03	70	0.01	7,800	1.3
现代弹簧钢	0.3	700	1.0	7,800	130
紫杉木	0.3	120	0.5	600	900
腱	8.0	70	2.8	1,100	2,500
橡胶	300	7	10.0	1,200	8,000

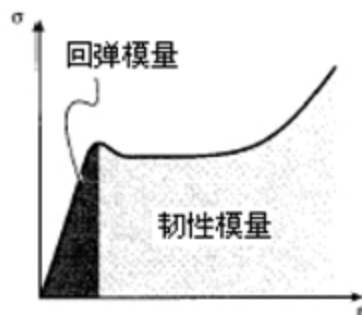


图 13 回弹模量和韧性模量

Exercise 1





1. Questions for discussion

- (1) Explains the following notions: stress, strain, stiffness, strength, ductility, hardness and toughness of materials.
- (2) Please give an example to explain the relationship structure and property of materials.
- (3) What are the differences between engineering stress-strain curves and true stress-strain curves?



1. Questions for discussion

- (1) Give the basic classifications of materials based on chemical makeup and atomic structure.
- (2) What are advanced materials? Please give some examples.
- (3) What do you think about the environmental impact of materials production?
- (4) What are renewable resources? Which types of materials are nonrenewable?

Exercise 2





2. Translate the following into Chinese

- **Tensile test**
- **Load cell**
- **Cross-sectional area**
- **Elastic modulus**
- **Plastic deformation**
- **Gauge length**
- **Fatigue failure**
- **Yield strain**



- (1) Applications of these materials depend on their properties; therefore, we need to know what properties are required by the application and to be able to relate those specifications to the material.**
- (2) True stress and true strain provide the most accurate description of what actually happens to the material during testing and so are widely used in materials science.**
- (3) “Ductile” materials are those that can undergo plastic deformation and so the greater the extent of plastic deformation, the higher the “ductility”.**





3. Translate the following into English

张力

无量纲的

动能

镍铜合金

极限抗拉强度

应力-应变曲线

弹性变形

熔点

共熔温度

蠕变