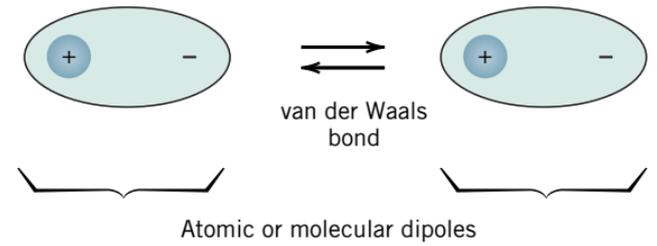
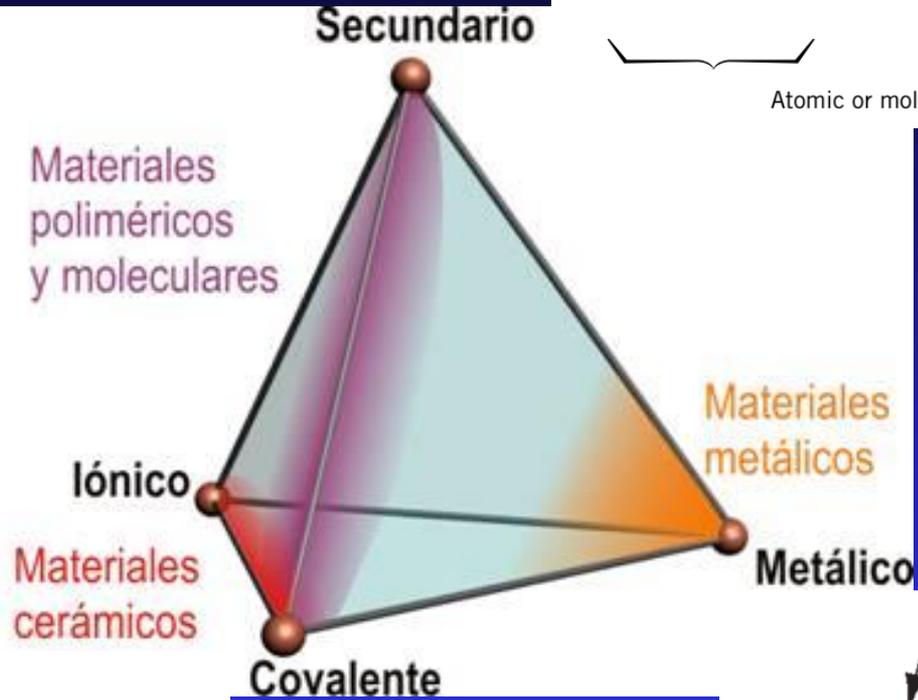
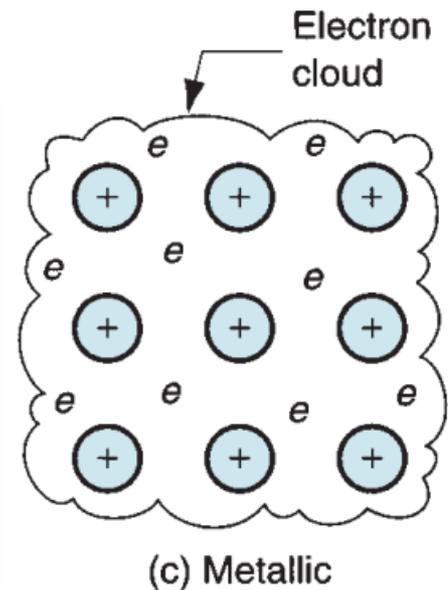
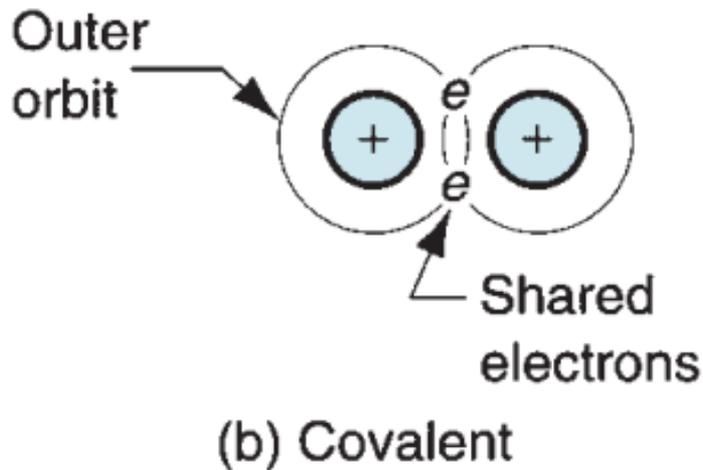
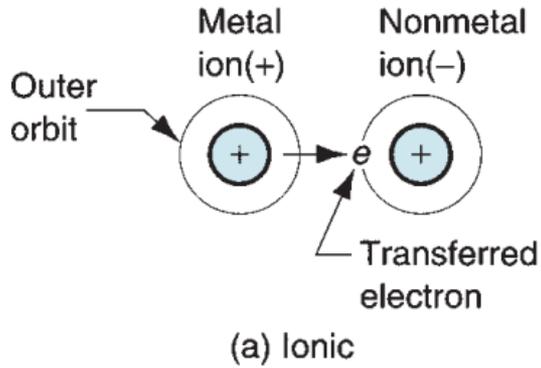


PRACTICA 1: ENSAYO DE TRACCION

ENSAYO DE TRACCION

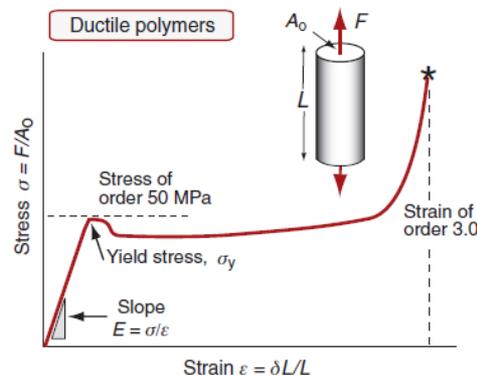
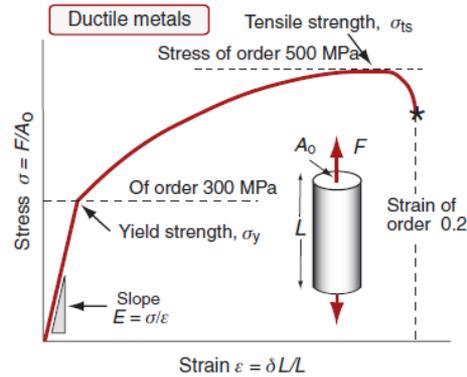
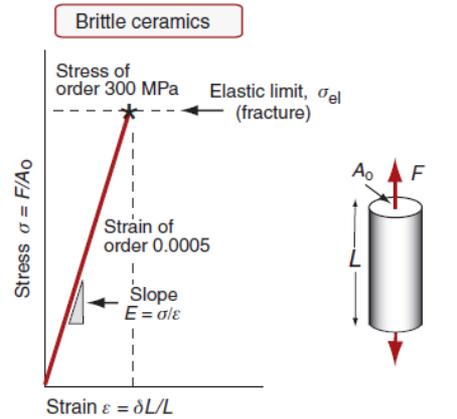
REFERENCIAS BIBLIOGRÁFICAS:

- **Capítulo XI** del libro “CIENCIA E INGENIERIA DE MATERIALES”. Prof. José Antonio Pero-Sanz Elorz
- **Norma: EN 10002-1:2001** “MATERIALES METALICOS. ENSAYO DE TRACCION. Parte 1: METODO DE ENSAYO A TEMPERATURA AMBIENTE”



Materials Class	Predominant Type of Bonding	Microstructure	Advantages
Metals & Alloys	Metallic	<ul style="list-style-type: none"> • Crystalline • Amorphous 	<ul style="list-style-type: none"> • Strong • Ductile • Conductive
Polymers	Mixed Covalent & Secondary	<ul style="list-style-type: none"> • Chain molecules • Networks • Amorphous 	<ul style="list-style-type: none"> • Low cost • Light weight • Resist corrosion
Ceramics & Glasses	Ionic, Covalent or Mixed "Ionic-covalent"	<ul style="list-style-type: none"> • Crystalline • Amorphous 	<ul style="list-style-type: none"> • Strong, stiff, hard • Resist creep • Resist corrosion
Intermetallics	Mixed Metallic with some ionic and covalent character	<ul style="list-style-type: none"> • Crystalline • Amorphous 	<ul style="list-style-type: none"> • Strong, stiff, hard • Resist creep • Resist corrosion • Light weight
Composites	Various	<ul style="list-style-type: none"> • Matrix + fibers • Matrix + particles • etc. 	<ul style="list-style-type: none"> • Strong, stiff • Light weight

General characteristics of major classes of engineering materials.



Tensile stress-strain curves for ceramics, metals and polymers.

ASPECTO SUPERFICIE FRACTURA



(a)

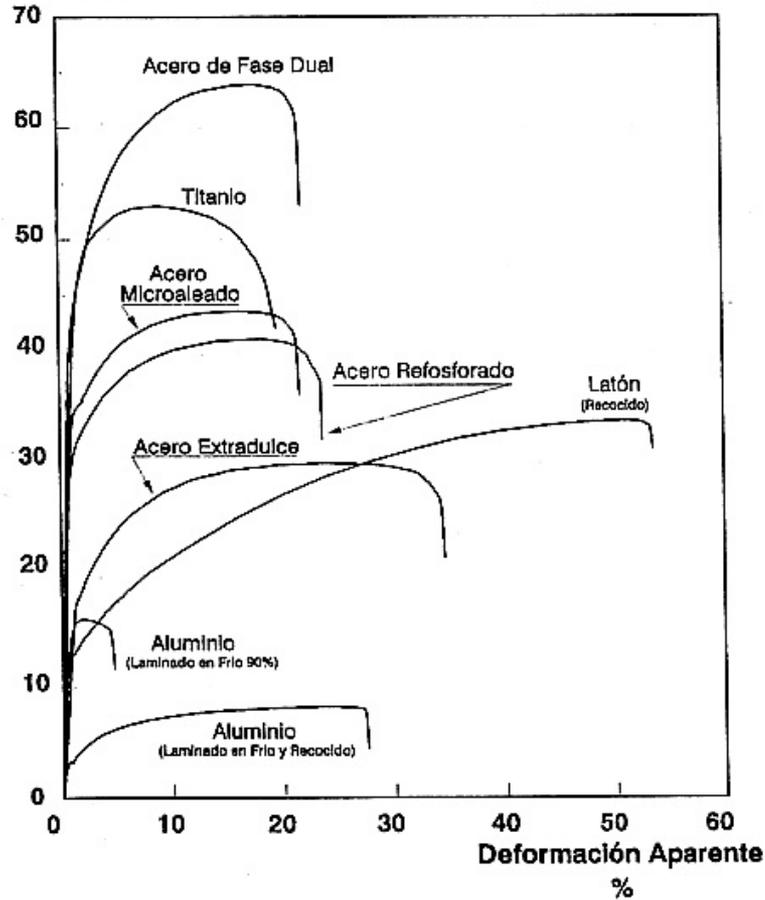
(b)

(a) Cup-and-cone fracture in aluminum. (b) Brittle fracture in a mild steel.

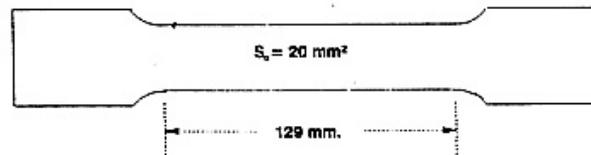
-Ensayo de Tracción.-

Tensión Aparente

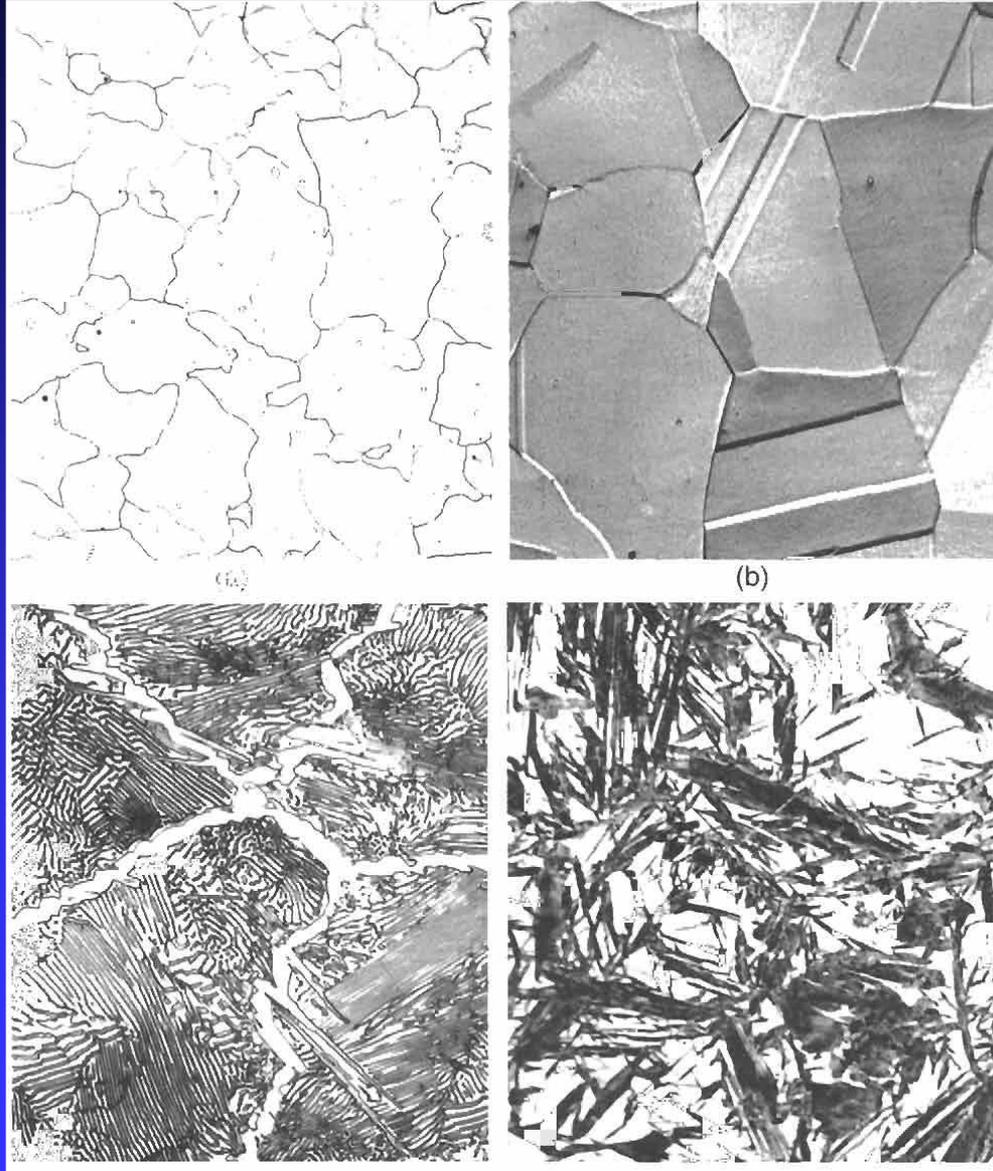
Kg/mm²

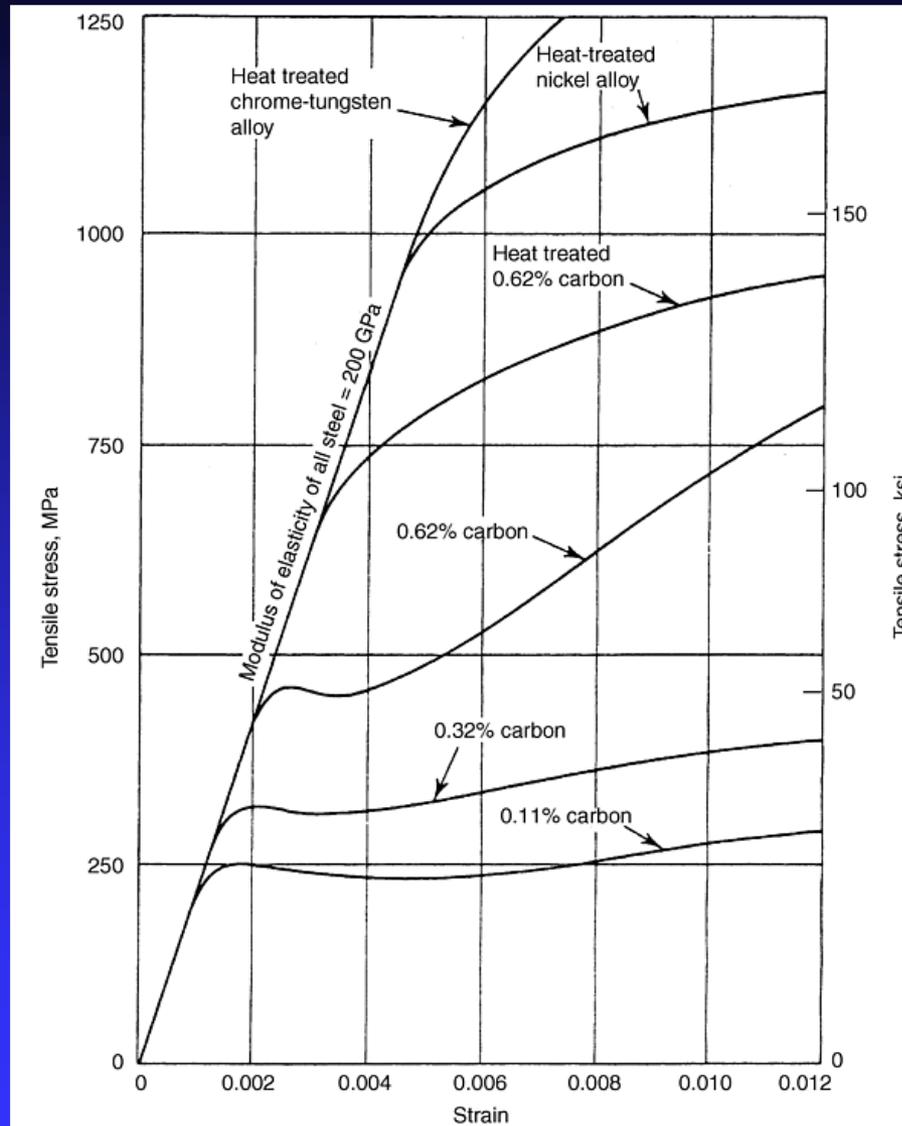


Tipo de Probeta:

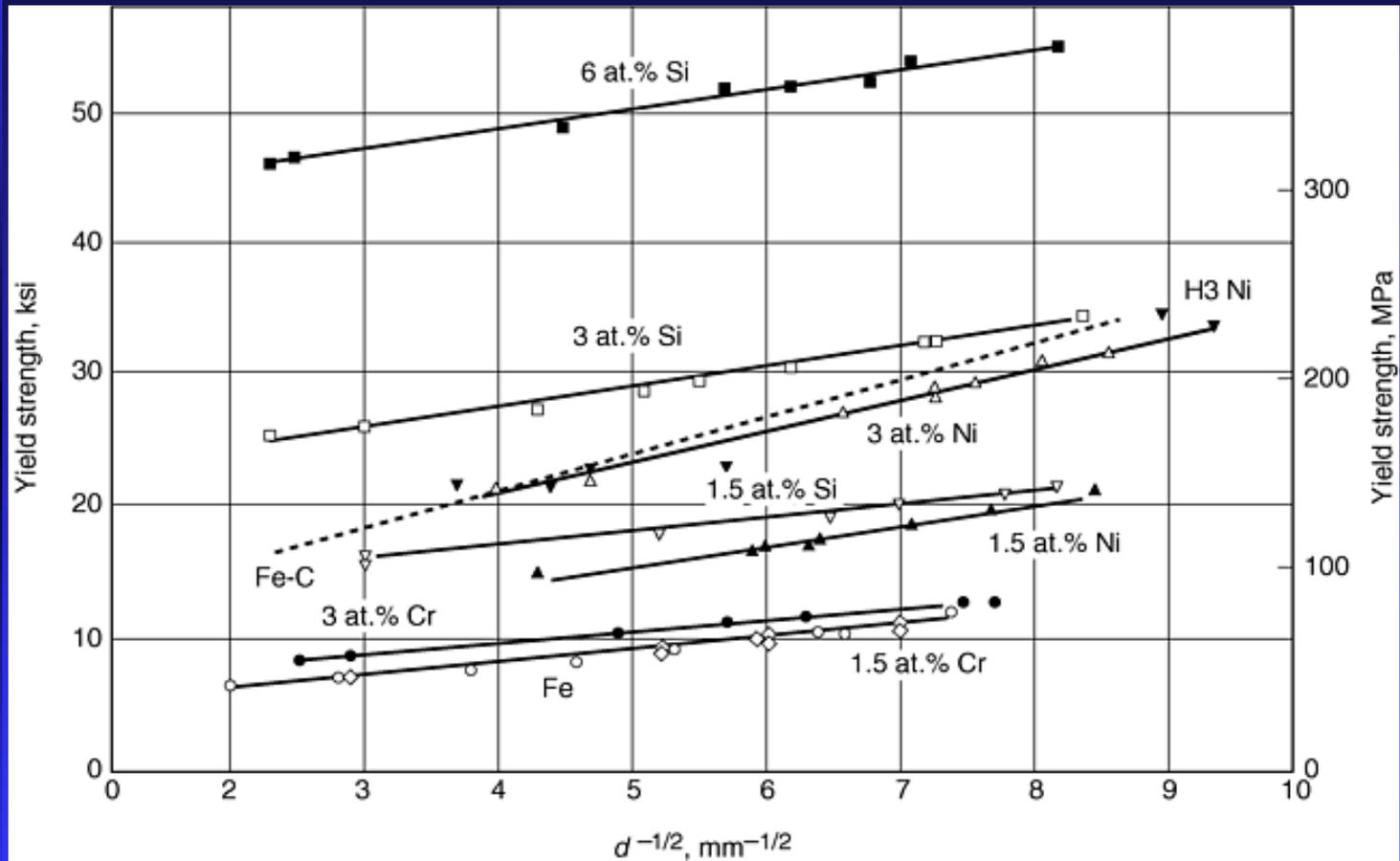


MICROESTRUCTURA

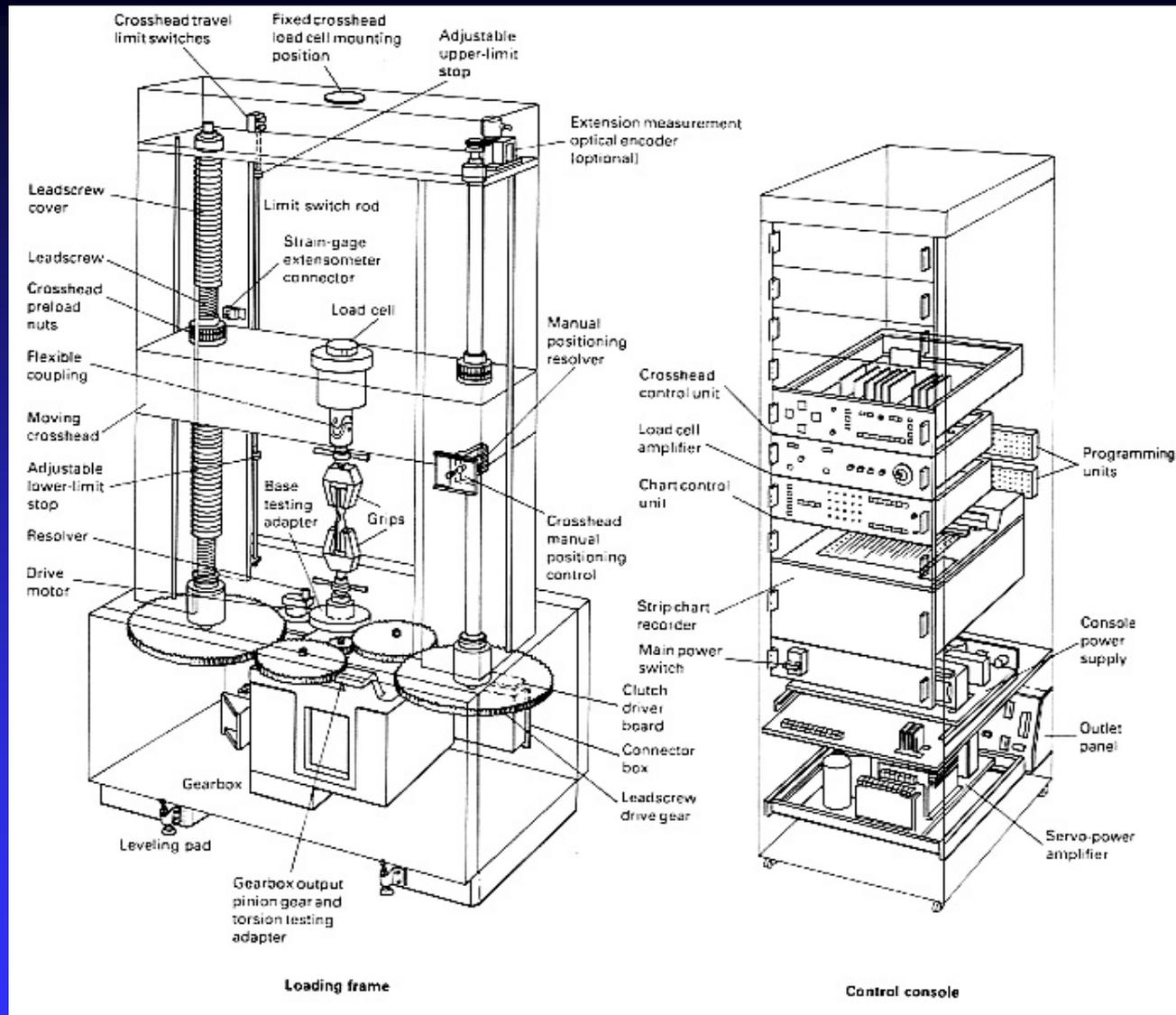




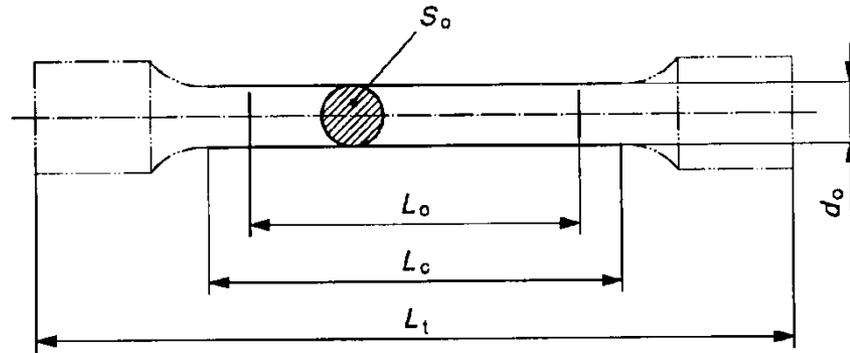
TAMAÑO DE GRANO



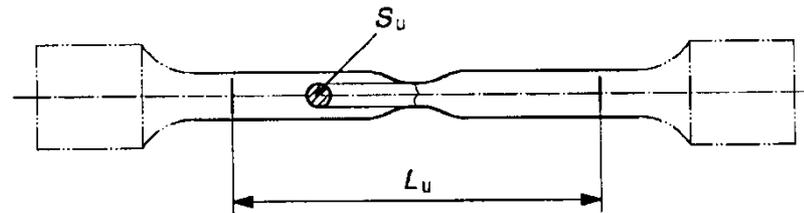
Influence of grain size diameter (d) on yield strength for α -iron alloys.



Máquina de tracción INSTRON 1195 Laboratorio de Ciencia e Ingeniería de Materiales



a) Antes del ensayo



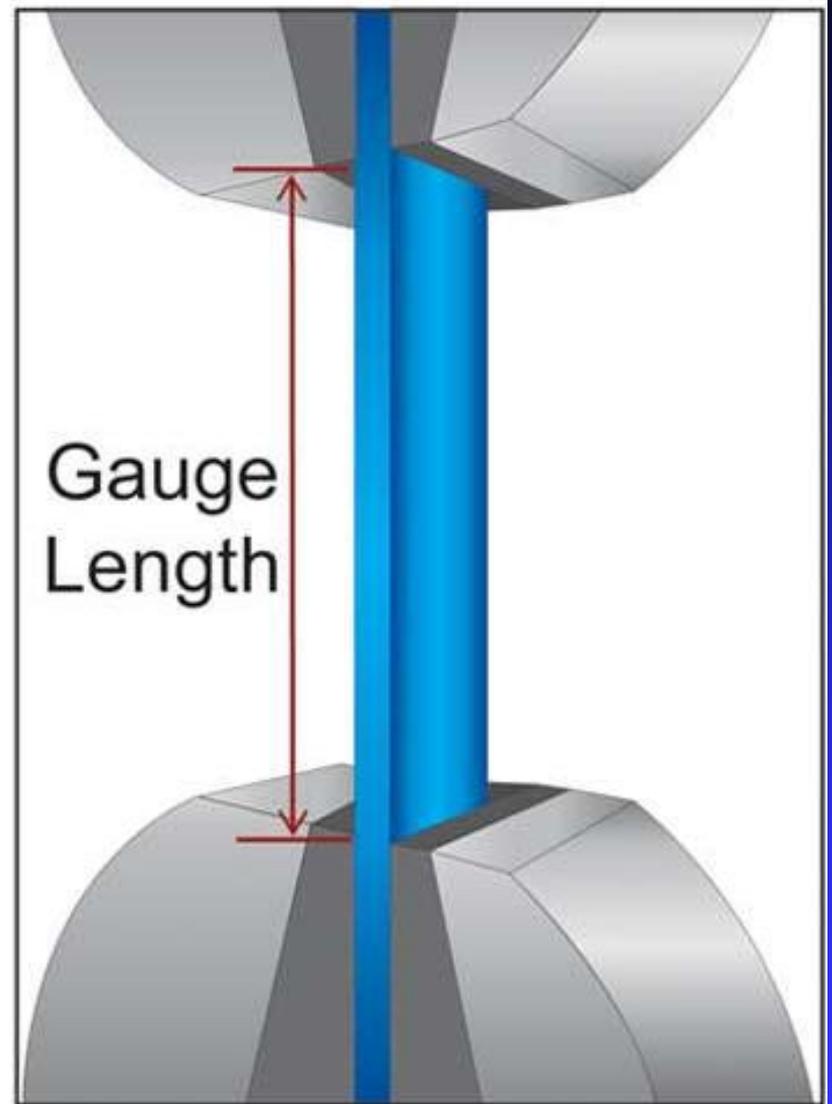
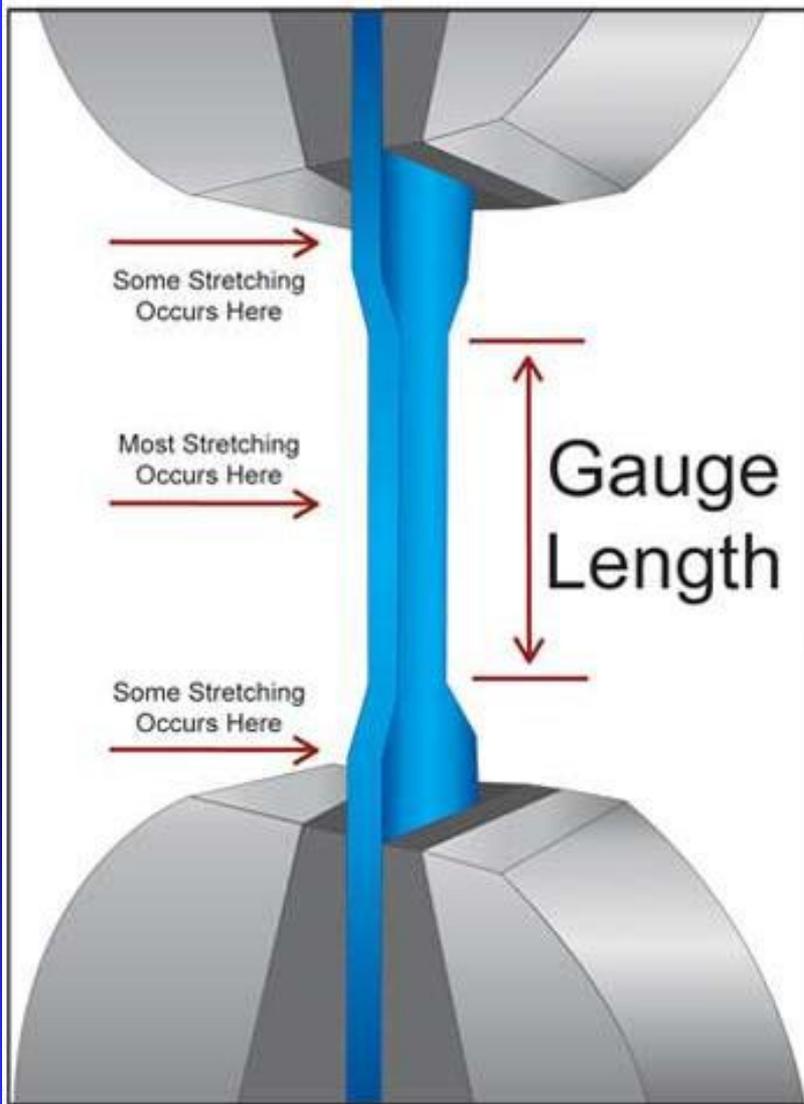
b) Después del ensayo

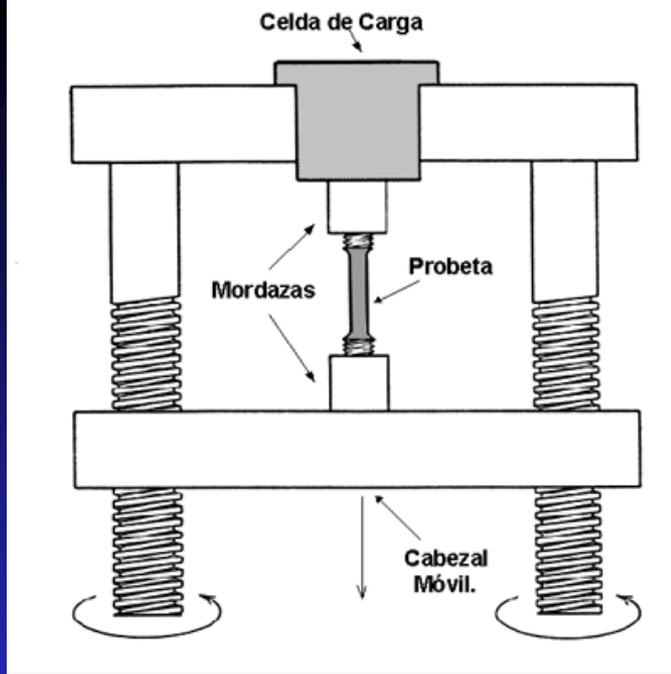
Leyenda

- d_o es el diámetro inicial de la parte calibrada de una probeta circular
- L_c es la longitud de la parte calibrada
- L_o es la longitud inicial entre puntos
- L_t es la longitud total de la probeta
- L_u es la longitud final entre puntos después de la rotura
- S_o es el área de la sección transversal inicial de la parte calibrada
- S_u es el área mínima de la sección transversal después de la rotura

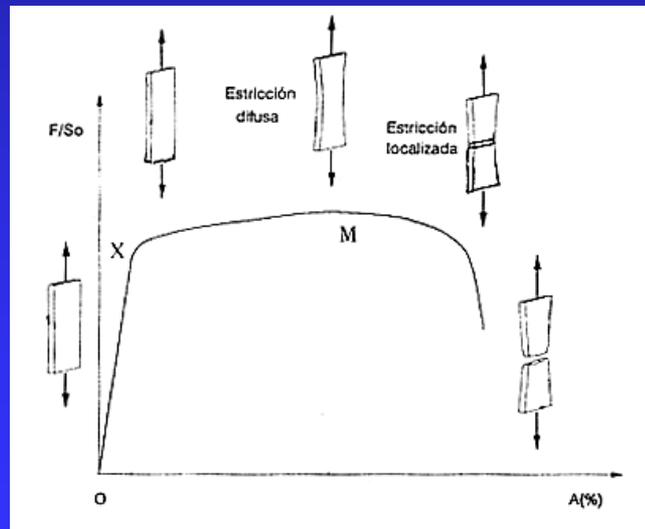
NOTA La forma de las cabezas de amarre de las probetas se proporciona únicamente con carácter informativo

Figura 13 – Probetas mecanizadas de sección transversal circular (véase el anexo D)

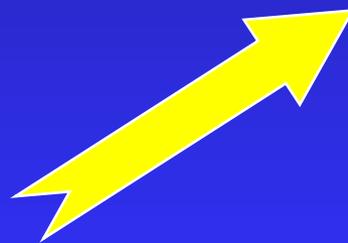
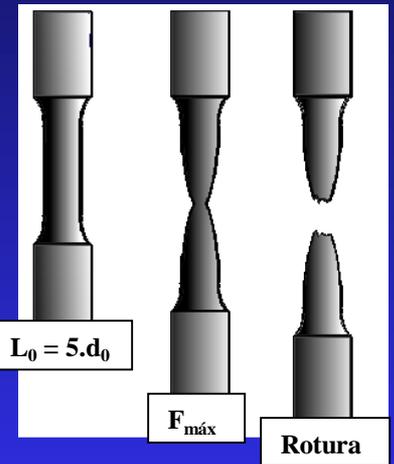


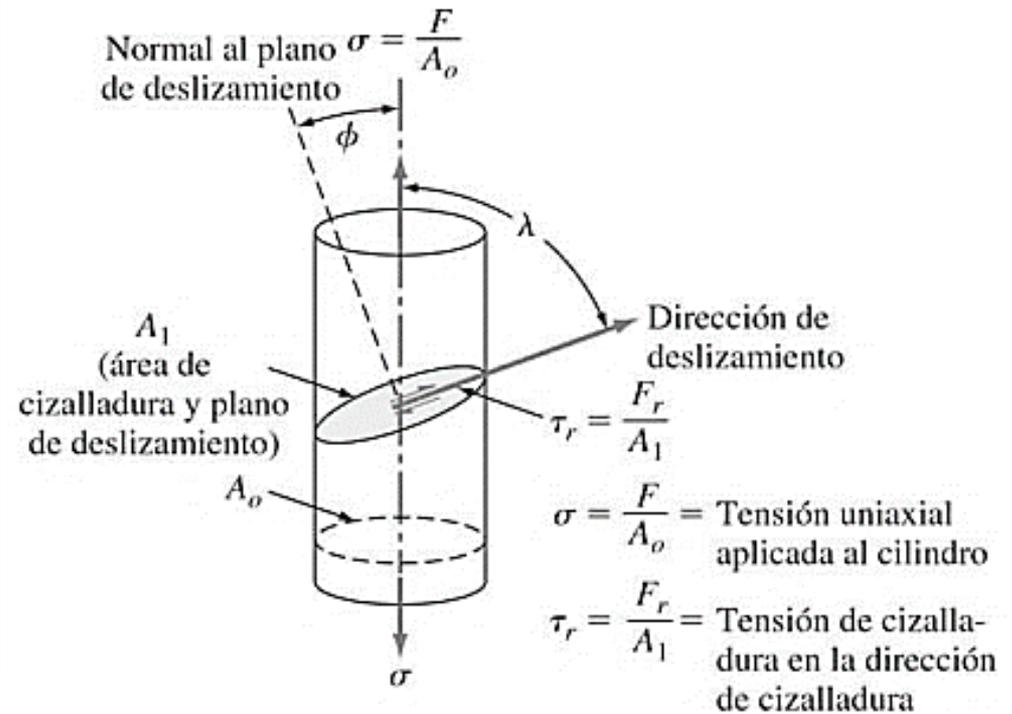
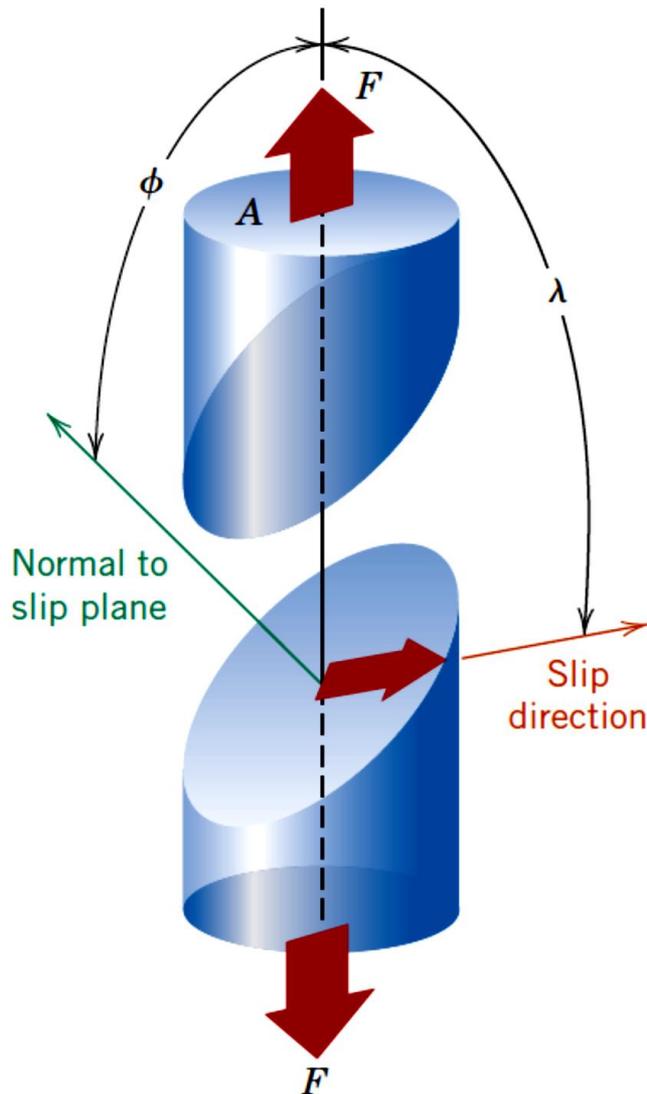


Esquema ensayo de tracción



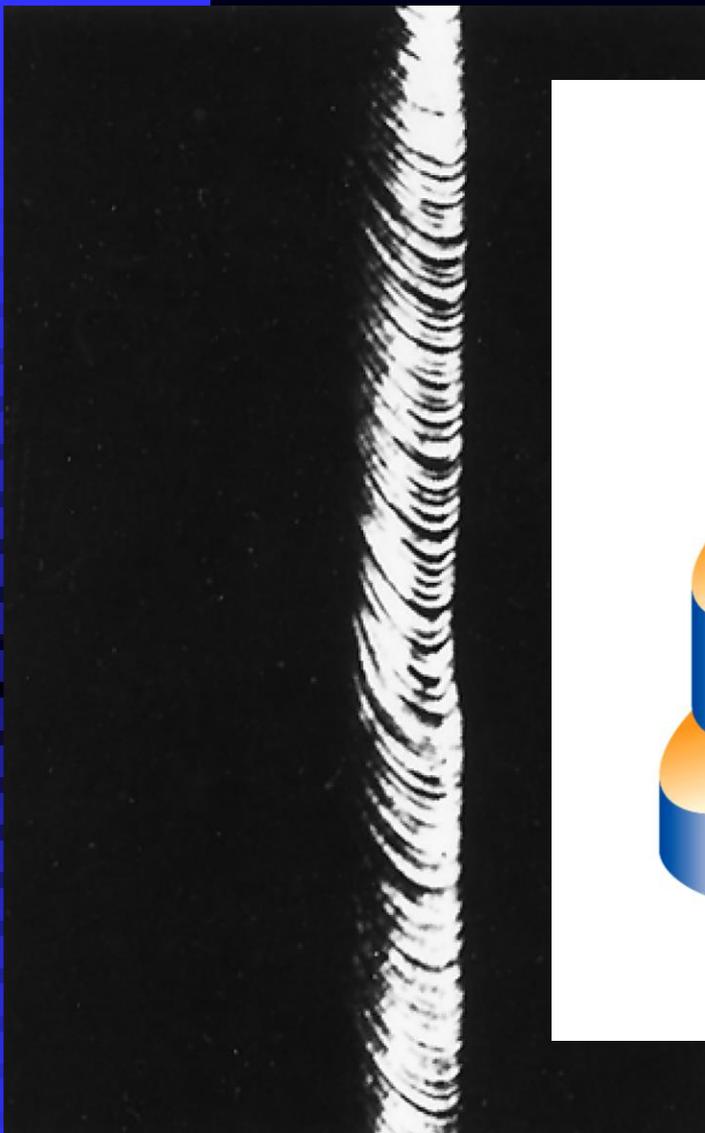
Curva de tracción aparente o ingenieril



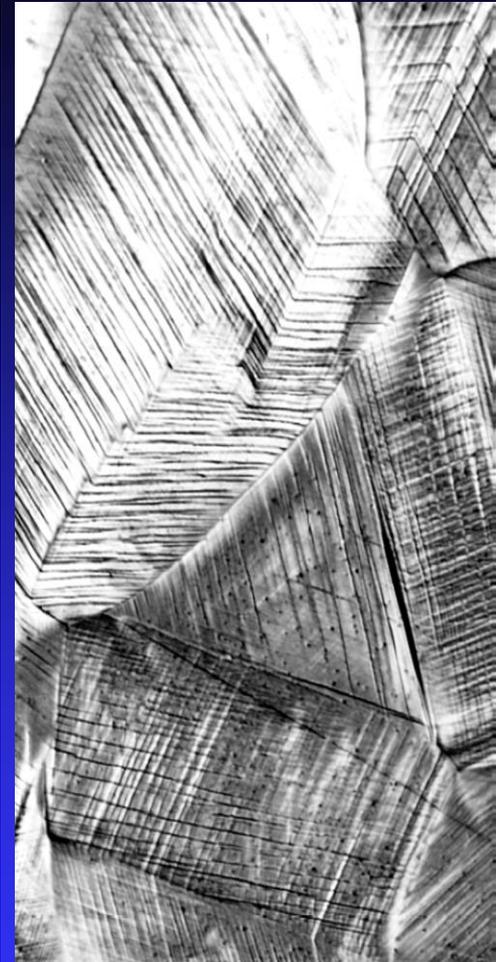
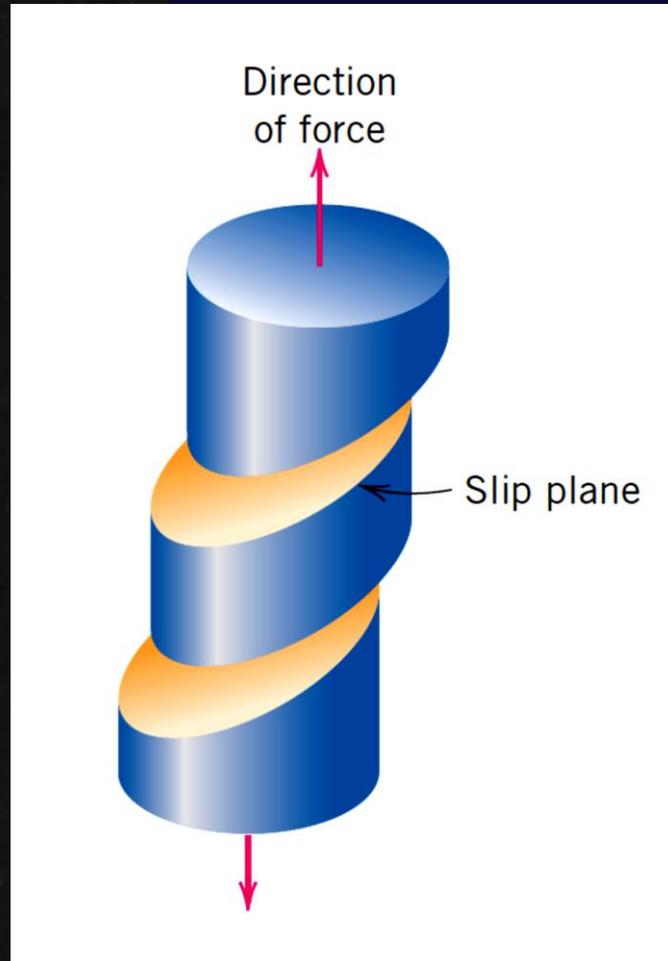


$$\tau_r = \frac{F \cos \lambda}{A_o / \cos \phi} = \frac{F}{A_o} \cos \lambda / \cos \phi = \sigma \cos \lambda \cos \phi$$

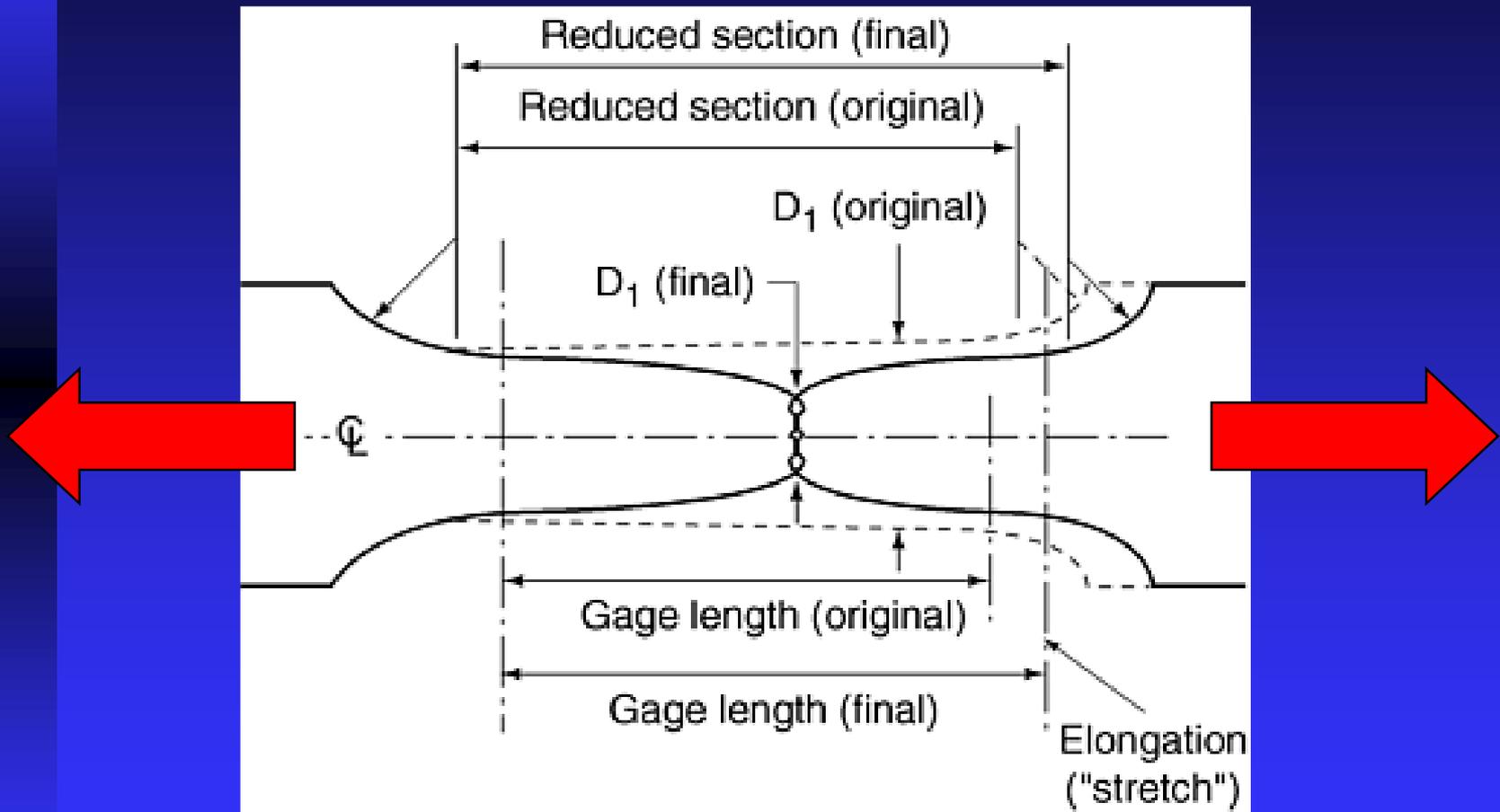
LEY DE SCHMID



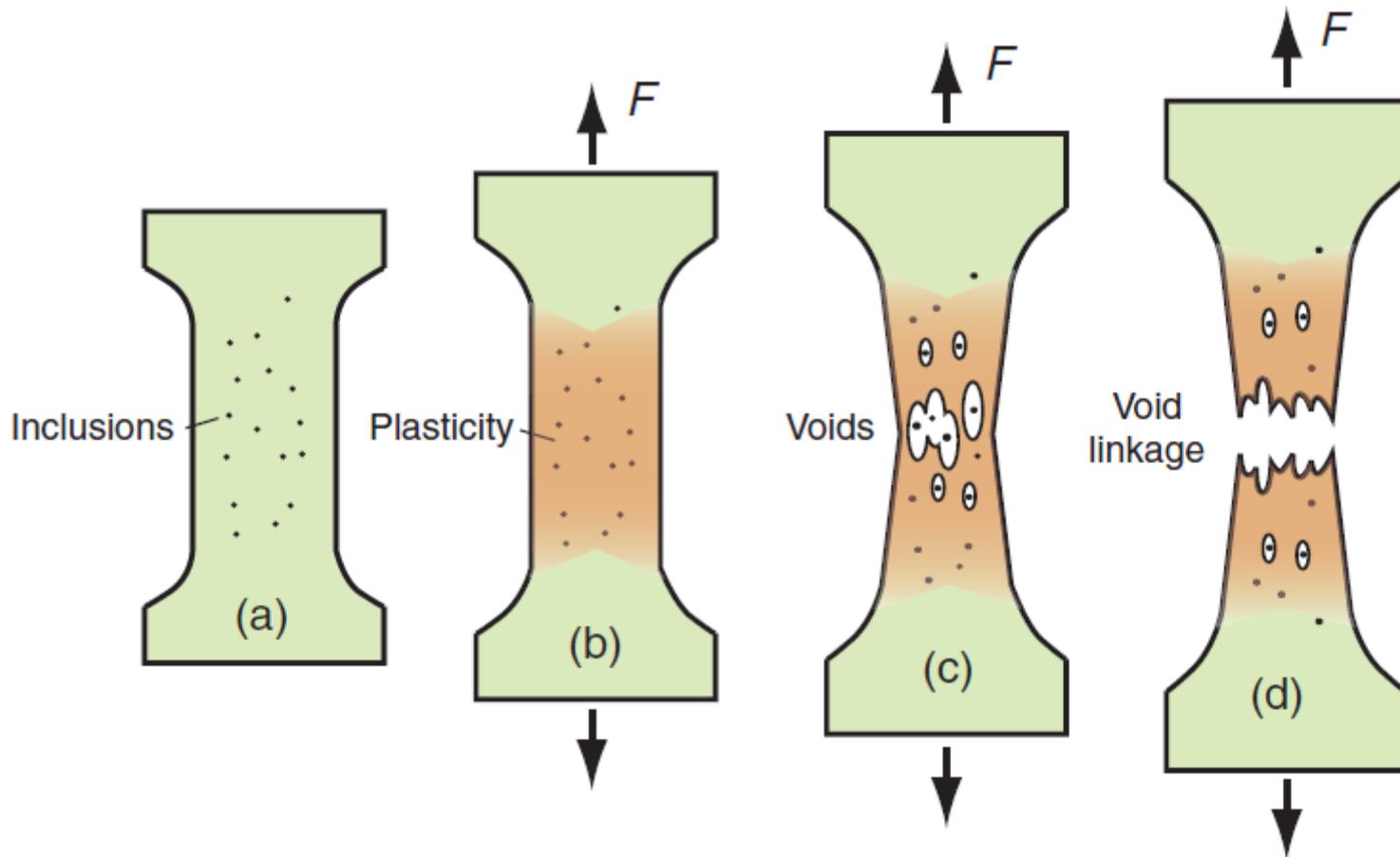
Deslizamiento en monocristal de Zn



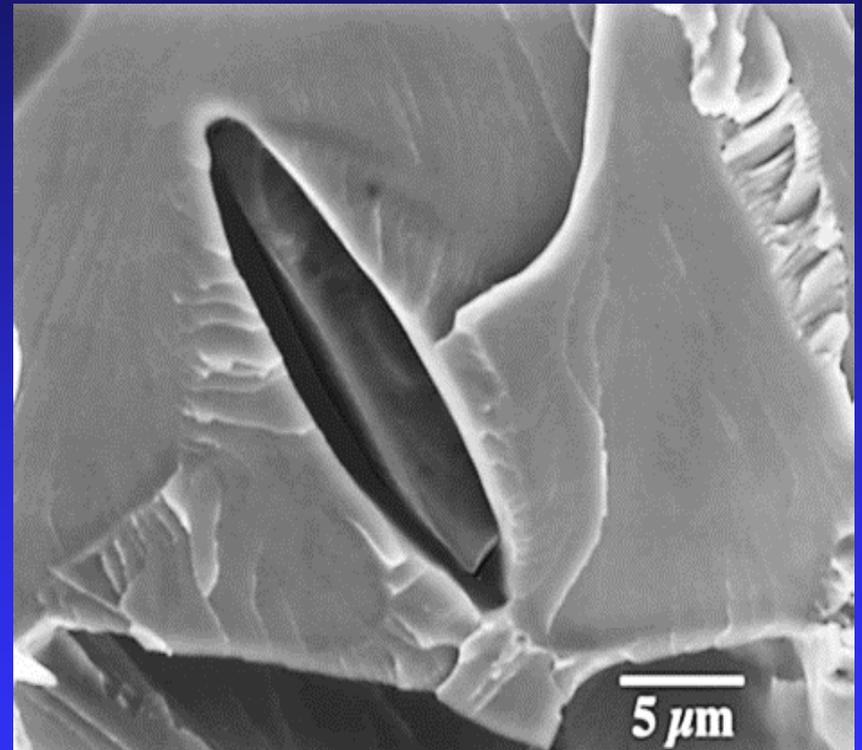
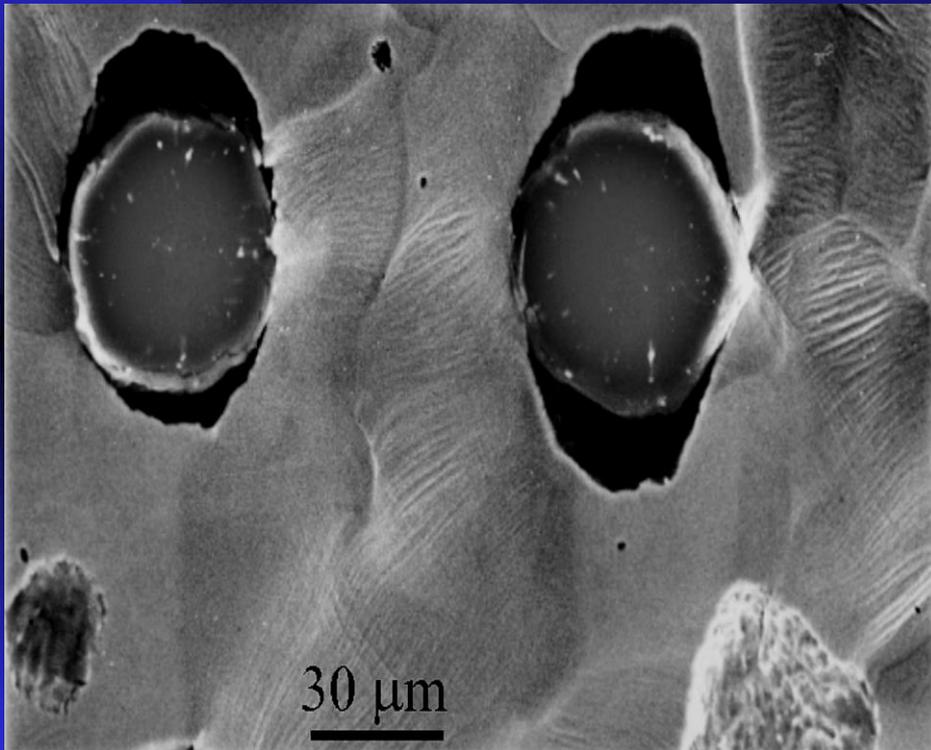
Líneas deslizamiento en superficie policristalina de Cu pulido y deformado



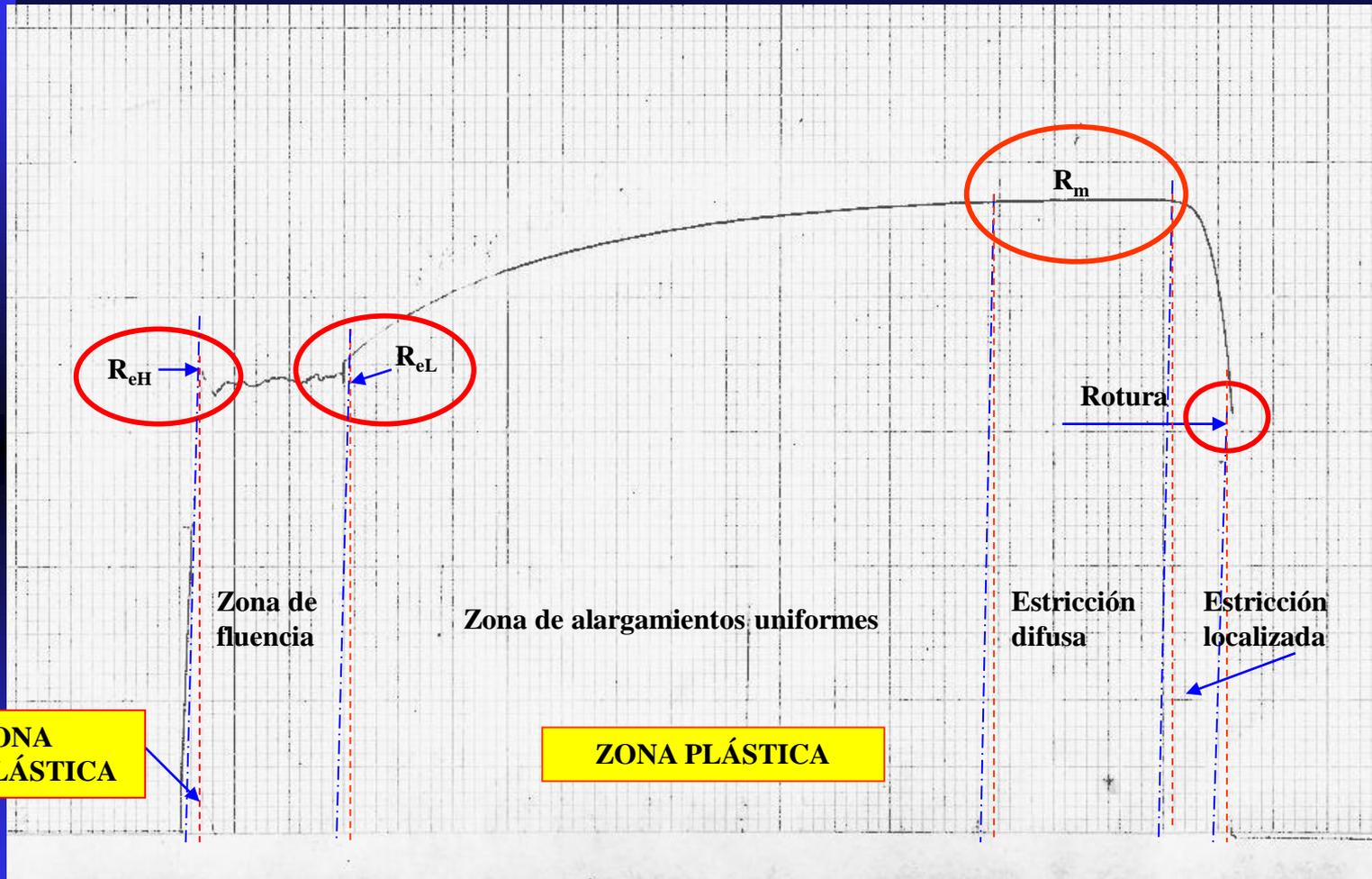
Secuencia rotura dúctil en tracción



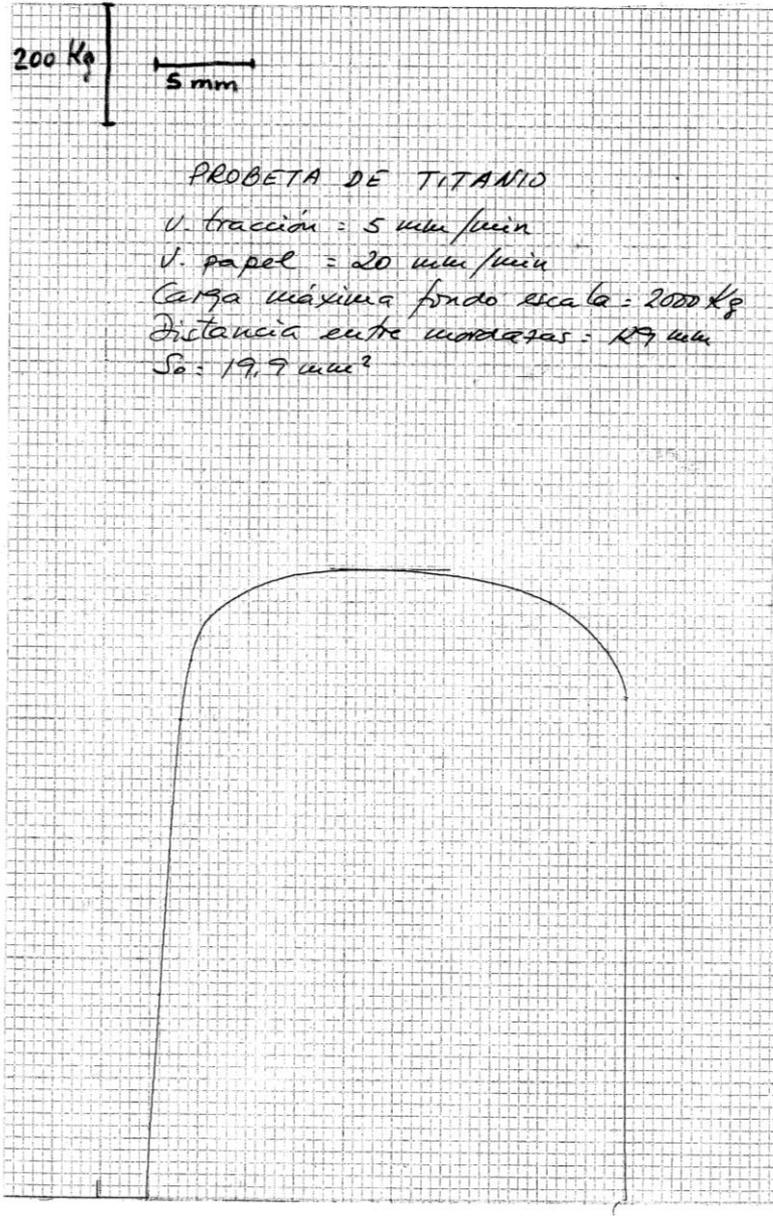
Descohesión matriz - inclusión

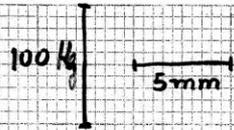


Material: F - 111



Eje cargas: 1 cm = 100 Kg; $L_{mordazas} = 150$ mm; $d_0 = 5,0$ mm; $d = 2,56$ mm





PROBETA ACERO CALMADO

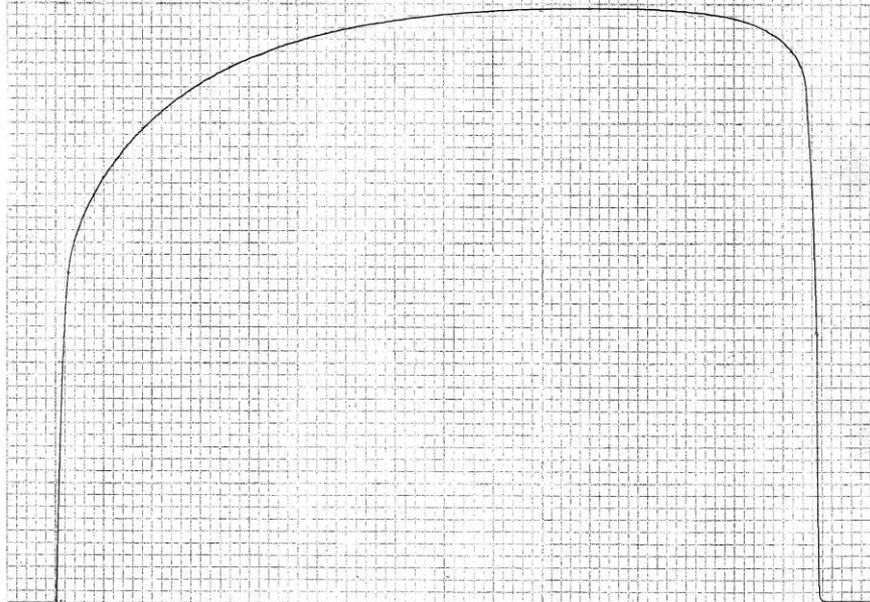
V. tracción = 5 mm/min

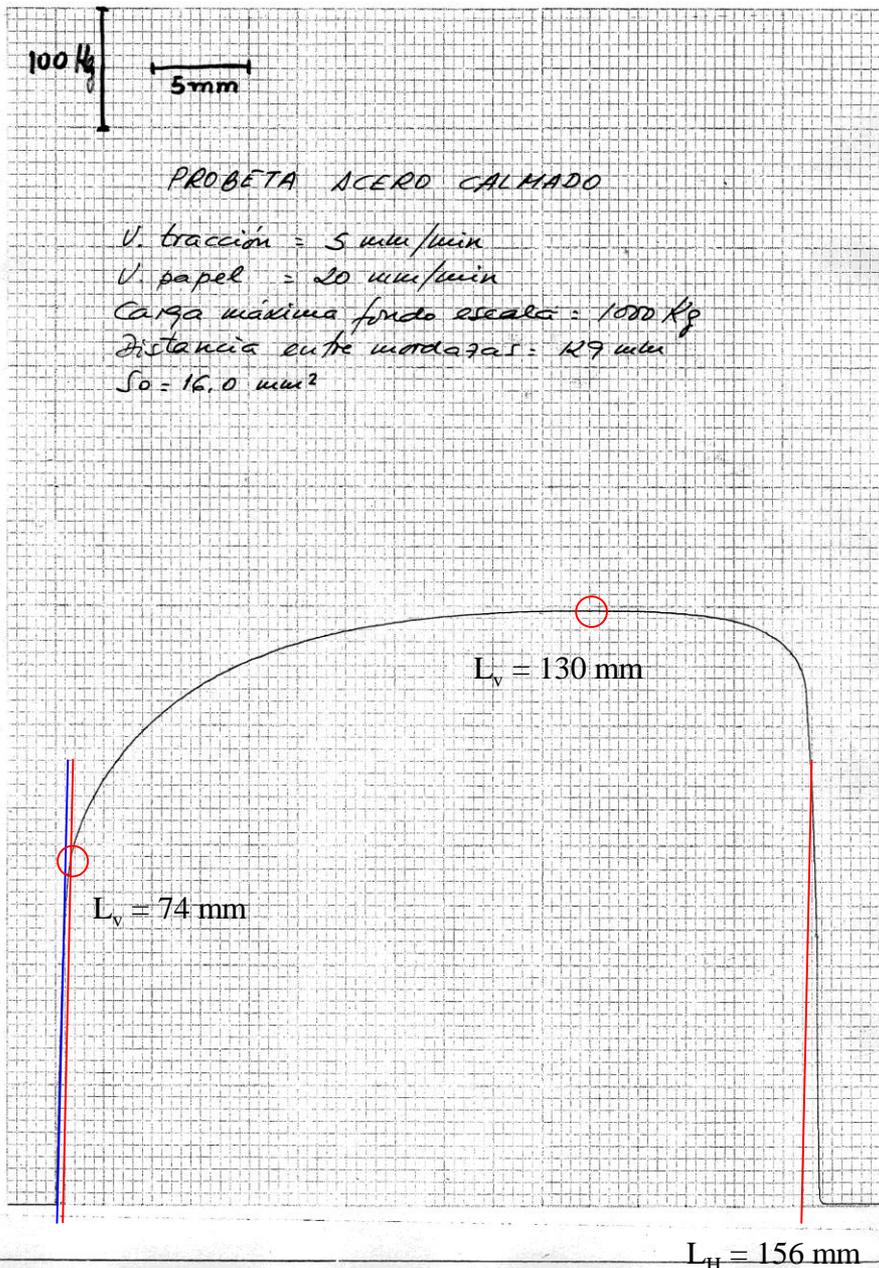
V. papel = 20 mm/min

Carga máxima fondo escala = 1000 kg

Distancia entre mordazas = 127 mm

$S_0 = 16.0 \text{ mm}^2$





Escala: 100 Kg \rightarrow 25 mm; 5 mm \rightarrow 20 mm

Límite elástico ($R_{p0,2}$)

Deformación: $(0,2/100) * 129 = 0,258 \text{ mm}$

$\Delta L = (0,258 * 20) / 5 = 1,03 \text{ mm} (\approx 1 \text{ mm})$

Fuerza: $F = (74 * 100) / 25 = 296 \text{ Kg}$

$R_{p0,2} = F / S_0 = 296 \text{ Kg} / 16 \text{ mm}^2 = 18,5 \text{ Kg/mm}^2$
 ($\approx 185 \text{ MPa}$)

Carga de rotura (R_m)

Fuerza: $F = (130 * 100) / 25 = 520 \text{ Kg}$

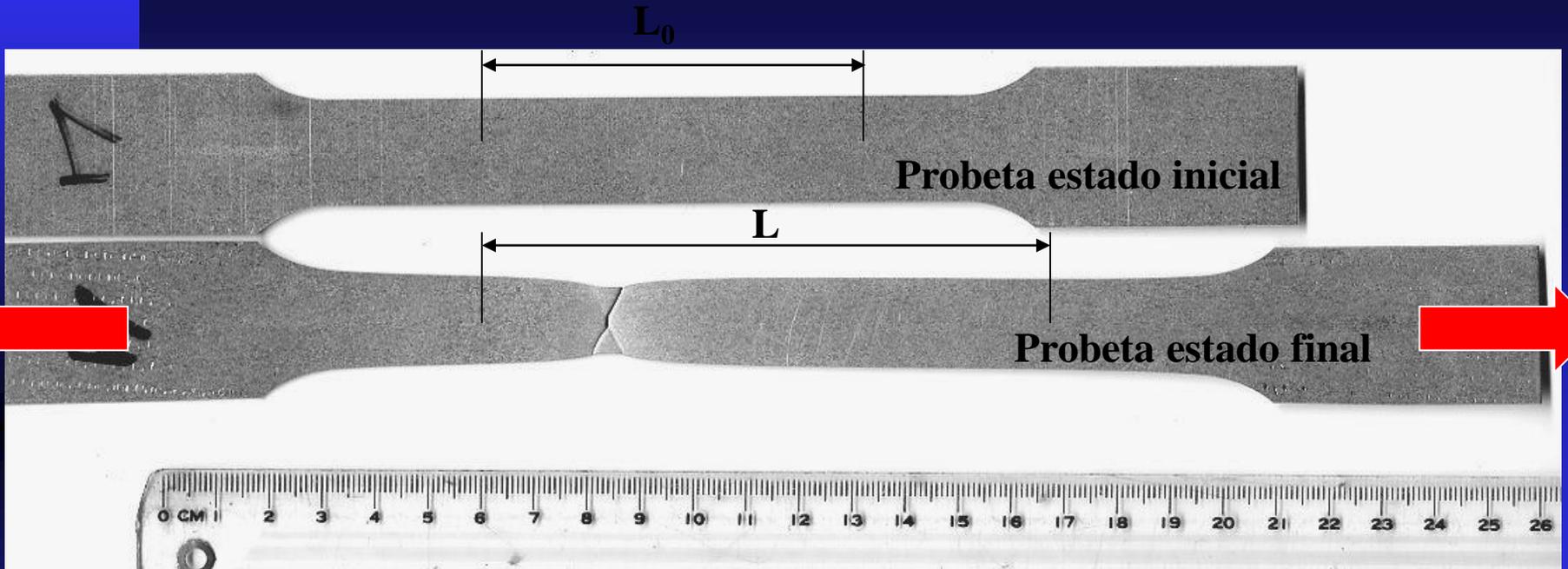
$R_m = F / S_0 = 520 \text{ Kg} / 16 \text{ mm}^2 = 32,5 \text{ Kg/mm}^2$
 ($\approx 325 \text{ MPa}$)

Alargamiento (A %)

$\Delta L = (156 * 5) / 20 = 39 \text{ mm}$

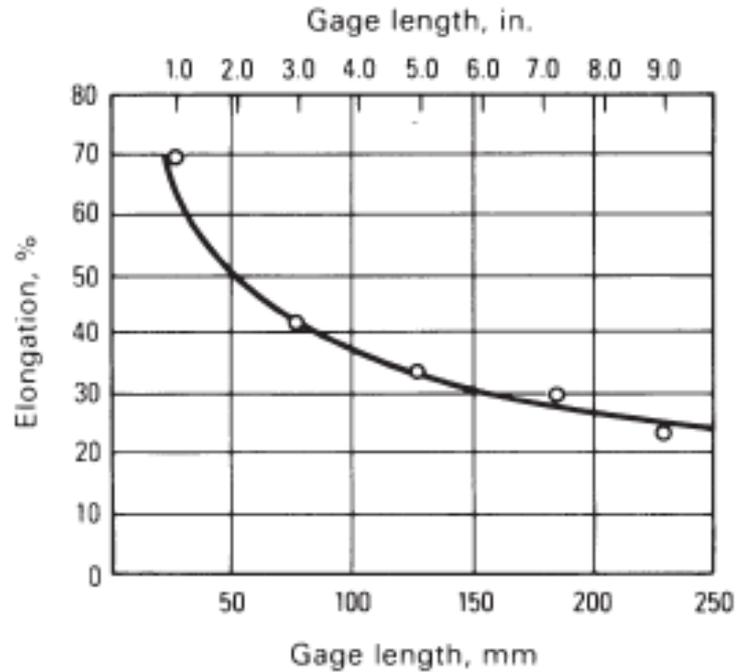
$A (\%) = (\Delta L / L_m) * 100 = (39 / 129) * 100 = 30,2 \%$

Alargamiento

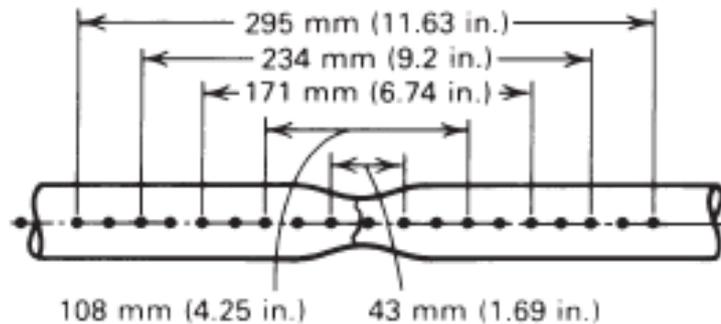


$$A(\%) = \frac{L - L_0}{L_0} \cdot 100$$

INFLUENCIA DE L_0 SOBRE EL VALOR DEL ALARGAMIENTO

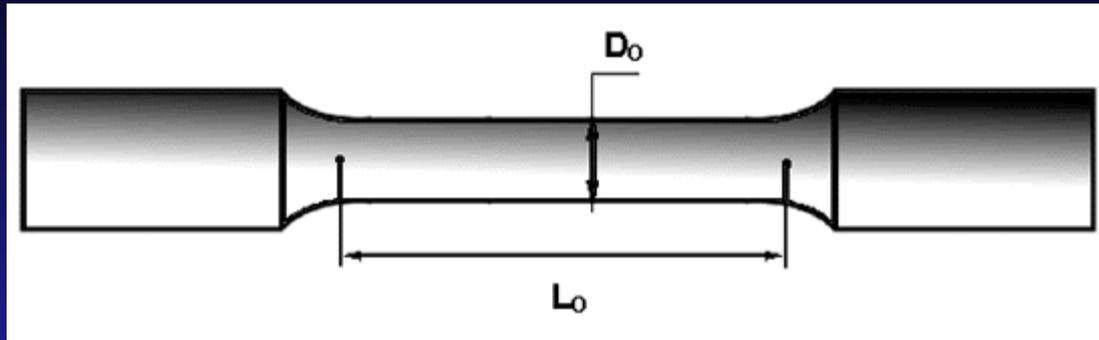


(a)

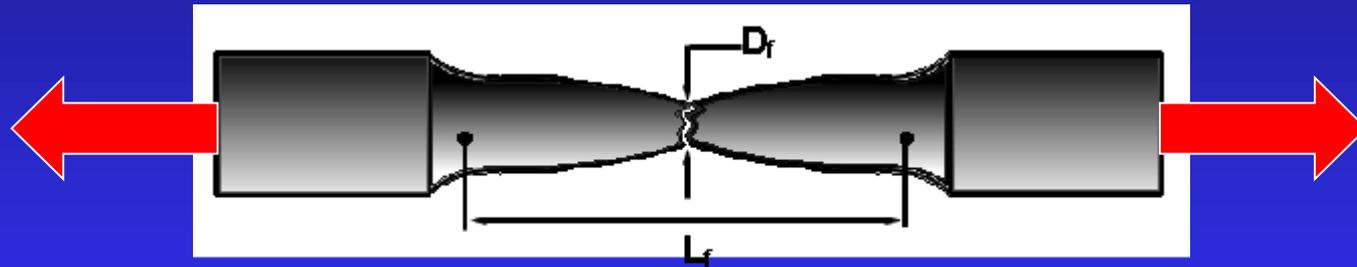


(b)

Estricción



Probeta estado inicial



Probeta estado final

$$Z(\%) = \frac{D_f - D_0}{D_0} 100$$