



Hardness and Elasticity Measurements

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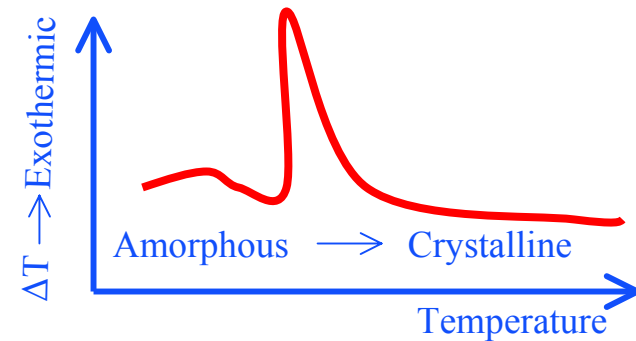
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Introduction

- Production of glassy metal
 - » Fusion of alloy
 - » Rapid quenching
- Vicker Hardness Test
 - » Tensile strength
 - » Critical crack length

PRODUCTION

- $(\text{Mo}_{0.6} \text{Ru}_{0.4})_{1-x} \text{B}_x$



- Glassicity range from $x=14$ to $x=24$

FUSING THE ALLOY

Mini-Arc Melter



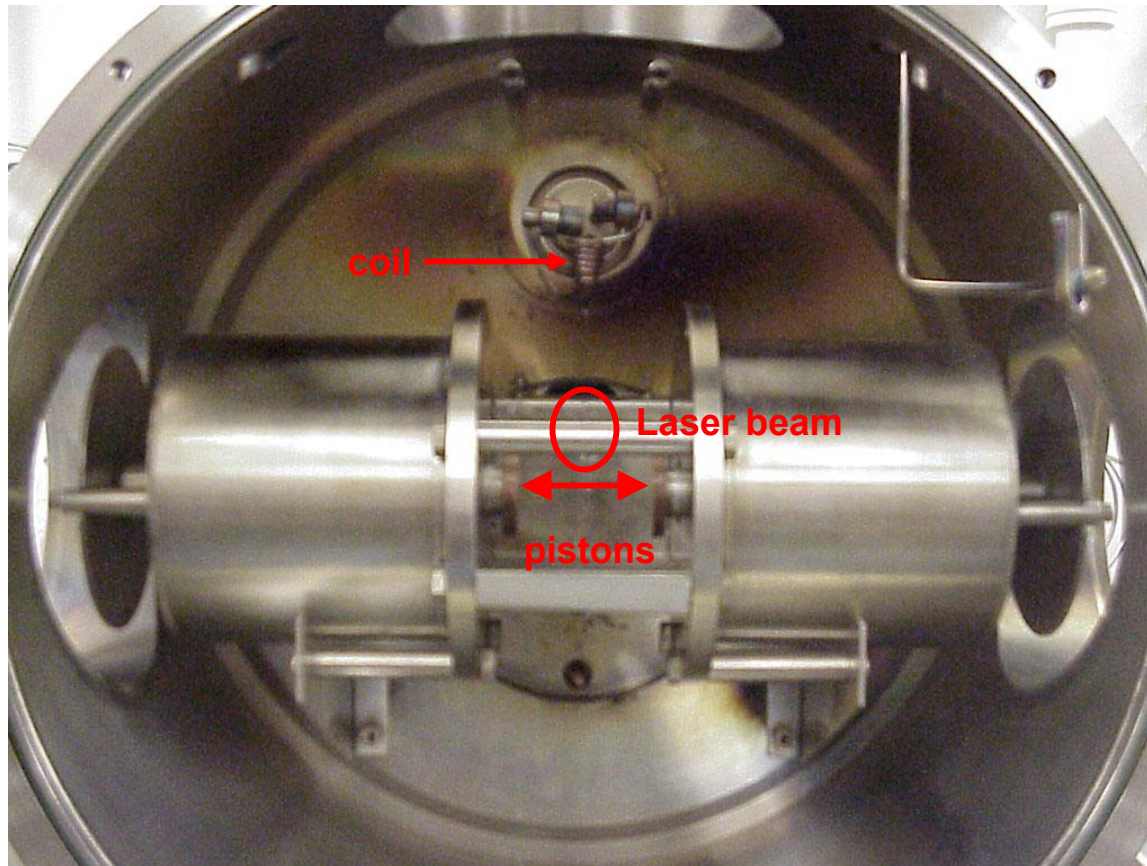
Copper mould

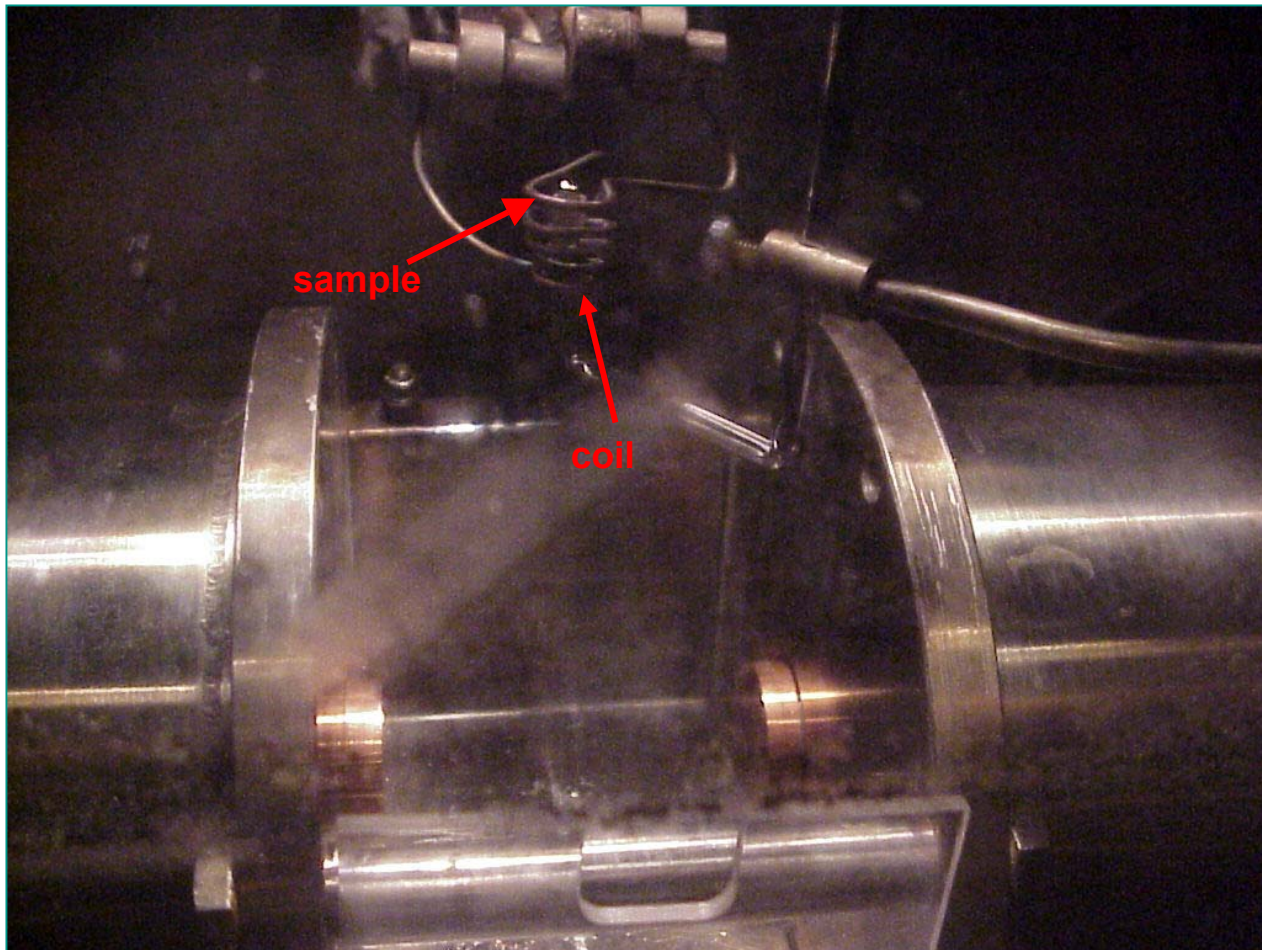


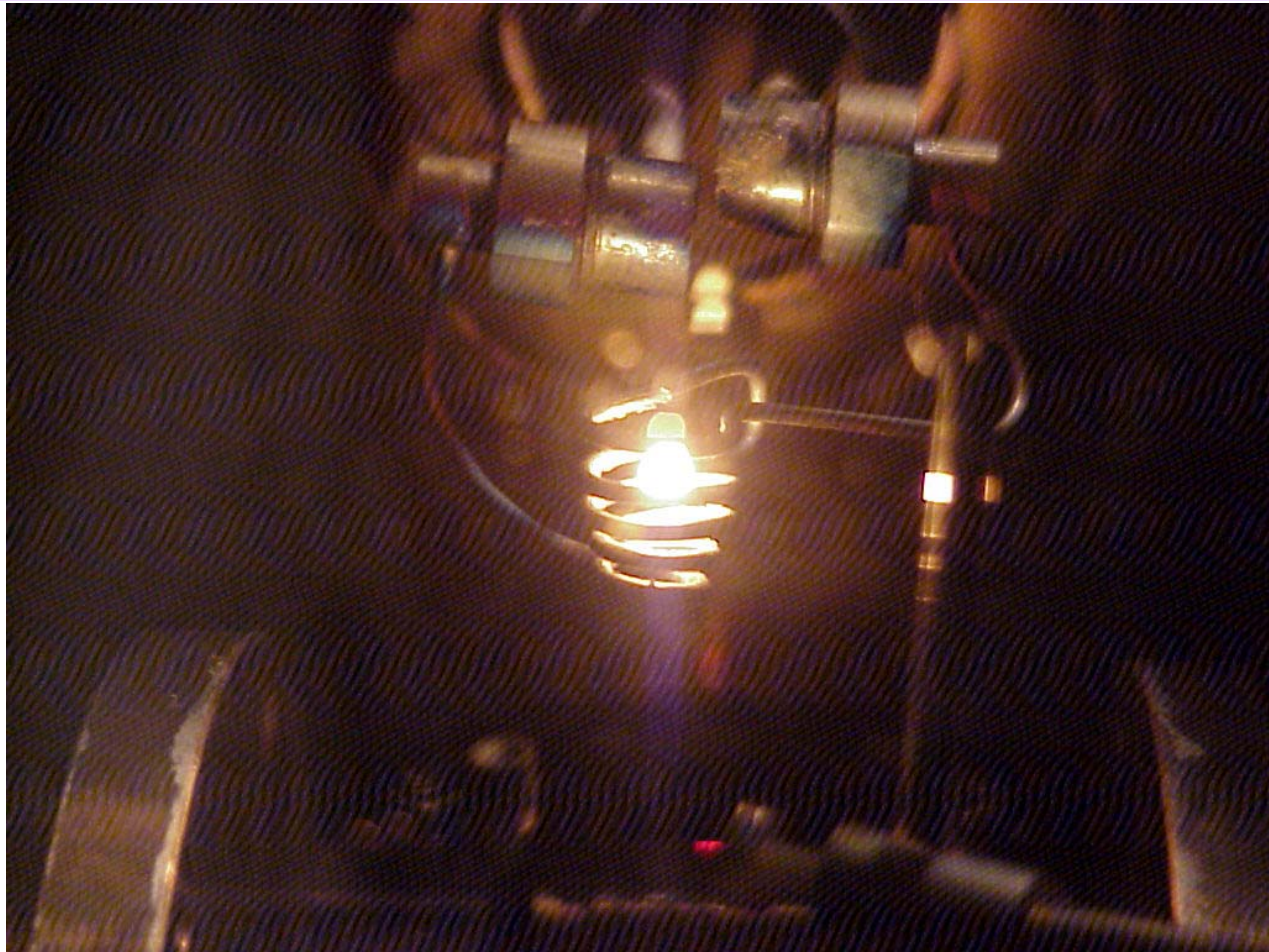
RAPID COOLING AMORPHOUS STAGE

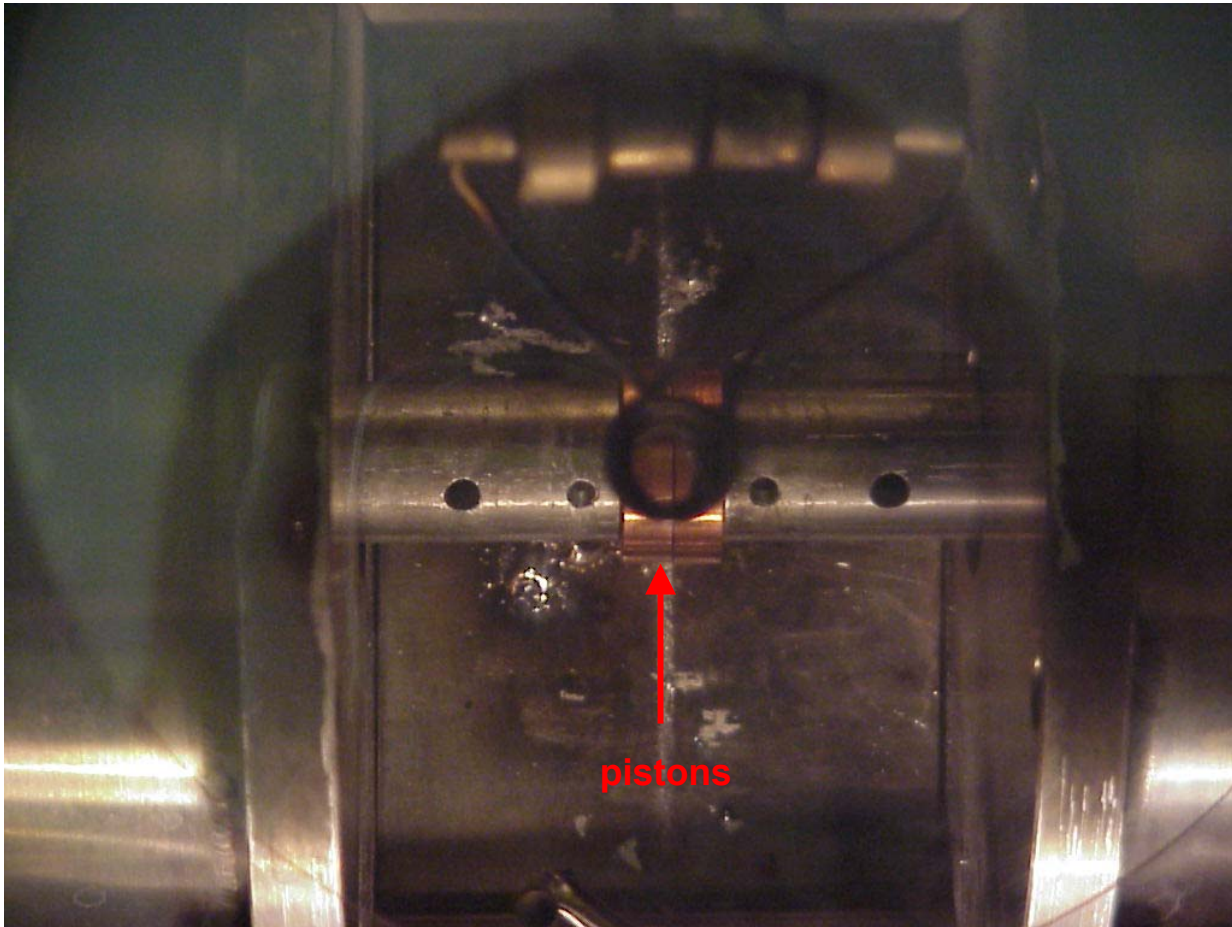
- Rapid quenching of MoRuB
 - » Employed cooling rates up to 10^6 K/sec
- Crystallization time
 - Hours for Fused Silica
 - Seconds for Glassy Metals

Ultra- rapid Quenching





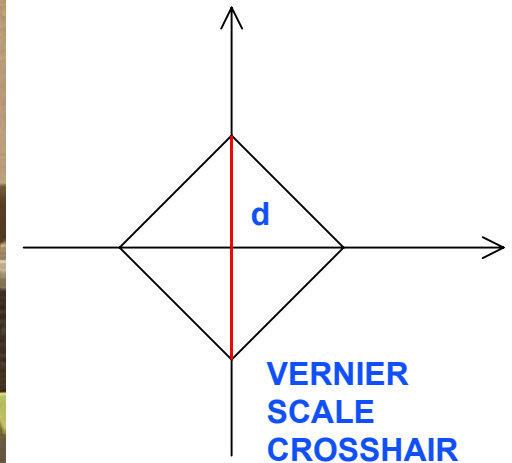
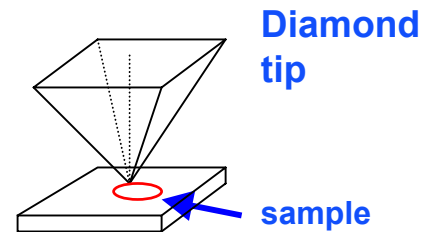
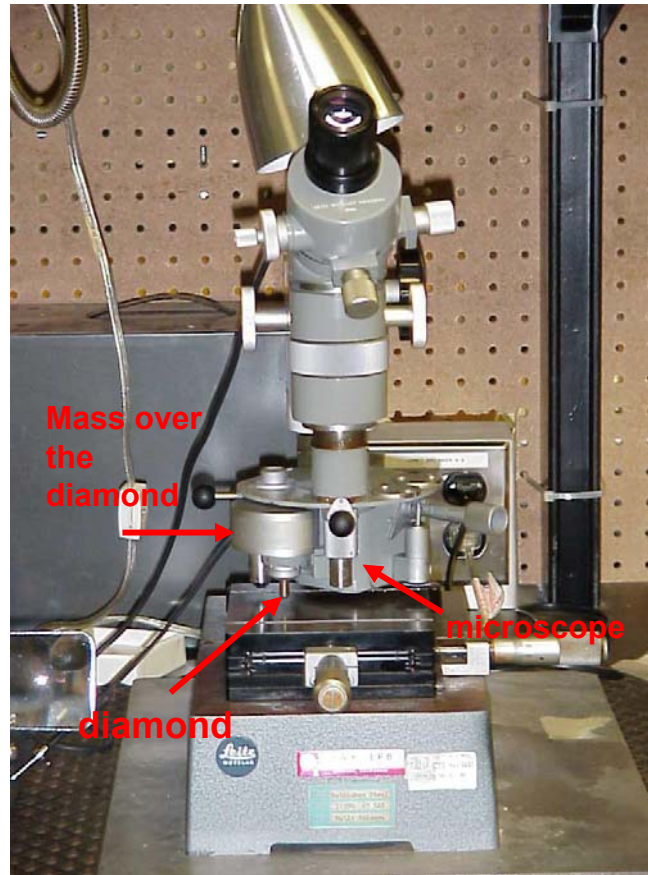






Apparatus For Hardness Test

- Example values
 MoRuB_{17}
 » $d=24.5 \mu\text{m}$



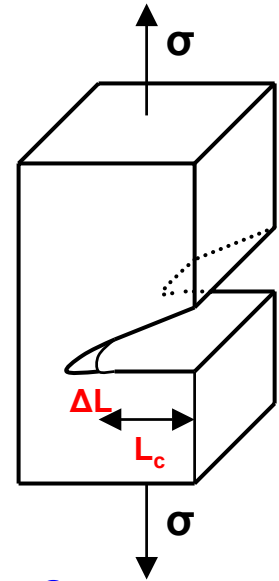
VICKER HARDNESS TEST

- $V.H = (1854)(m) / d^2 = [Gpa]$
 - » $V.H.=1556.4 \text{ G Pa}$
- Tensile Yield strength: $\sigma_Y = V.H / 300$
 - » $\sigma_Y=5.2 \text{ G Pa}$
- 5.2 Gpa is in agreement with literature

Calculations

- Stress Intensity Factor/ Fracture toughness:

$$K_{IC} = 45 \text{ M Pa } / \text{m}^{1/2}$$



- Critical Crack Length: $L_c = (K_{IC}/\sigma_Y)^2$
» $L_c = 75 \text{ } \mu\text{m}$

Conclusions

- Confirmed the amorphous state
 - » X-ray Diffraction (Brian)
- Confirmed composition
 - » Through thermal analysis (Barbara)
- Measured strength values (within 10%)
 - » Vicker Hardness test

Continuation of Work

- » Will characterize full amorphous range for MoRuB
- » Will study the changing trends of Yield strength and elasticity due to the varying Boron atomic percent in MoRuB



THANKS TO

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