METC 143 LAB NOTEBOOK

SPRING 2014

Tanner

INSTRON 5960 DUAL COLUMN TABLE TOP UNIVERSAL TESTING SYSTEM

By: "Wild" Billy and Tanner

What it is.

- We know it best as one of our tensile testers
- Universal, static testing systems that perform tensile and compression testing
- Can also perform shear, flexure, peel, tear, cyclic, and bend tests.

Features

- Load measurement accuracy: +/- 0.5%
- Up to 2.5 kHz data acquisition rate
- Speed range of 0.001 - 3000 mm/min
- 50 kN (11,250 lbs) capacity
- 1212 mm (47.7 in) vertical test space

How it works

- Pressure is applied from various directions, to test different properties of the metal.
  - Compression
  - Tension
  - As well as a variety of other tests

Instron in Action!!!!!

- http://www.youtube.com/watch?v=ivTHHyHTjNU

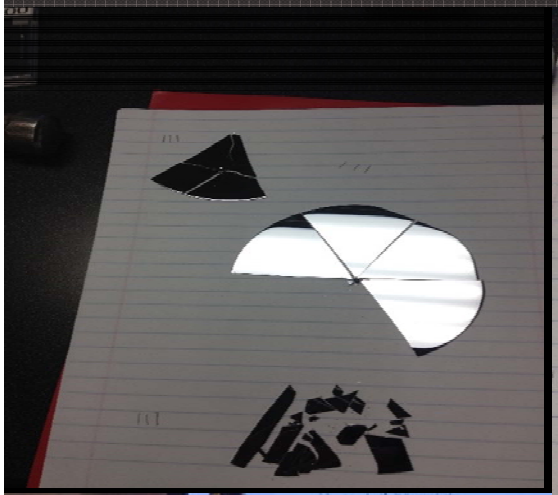
Source

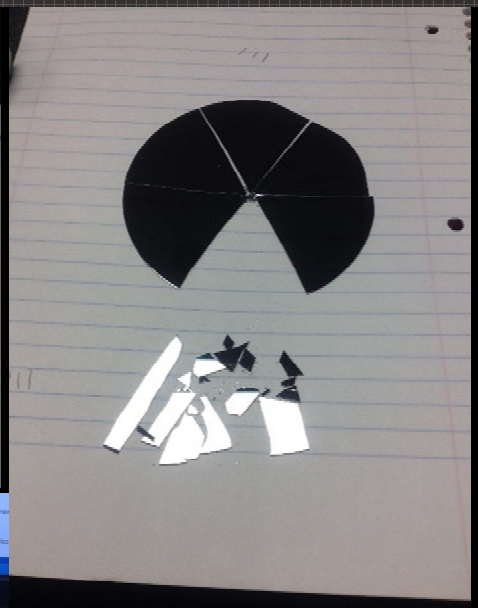
http://www.instron.us/wa/product/5960-Dual-Column-Testing-Systems.aspx

Lab 2/Crystallography Lab

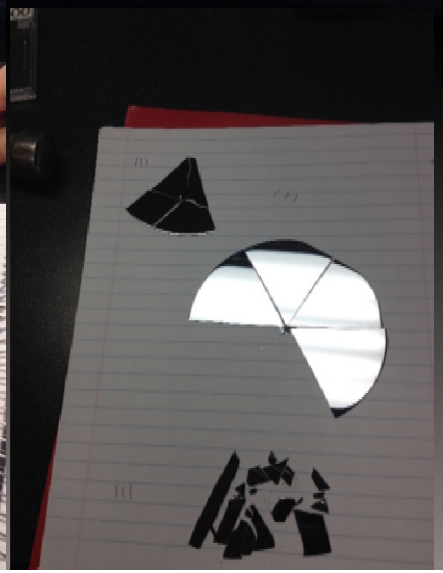
- Post-Activity Questions
- 1. In this activity, you broke two silicon wafers. One wafer had a (100) crystal surface
- plane orientation and the other a (111) surface plane orientation. In the making of the
- original silicon ingot, what determined the crystal orientation of the silicon wafer? The number of surface atoms are
- 2. At what approximate angle did the (111) wafer b
- break? It broke into 6 separate 60 degree pieces
- 3. At what approximate angle did the (100) wafer break? It broke into 4 separate 90 degrees pieces
- 4. Did each wafer continue to break at the same angle when you broke the smaller pieces?
- Why or why not? Silicon wafer (100) broke an individual piece for second time the results were not exactly 4 90 degree pieces like before but for the most part rectangles or perfect squares. Silicon wafer (111) when a piece was broken for a second time, broke into 6 almost exact representational pieces of the original broken pieces as the first break was.
- 5. Which orientation (100) or (111) has more silicon atoms exposed to the wafer's surface? 111
- 6. Why is crystal orientation important in the fabrication of microsystems? To be able to know and produce a piece of material with the necessary requirements that particular piece of material needs to at hear to.
- 7. Identify the crystal orientation of each of the following pieces of silicon.

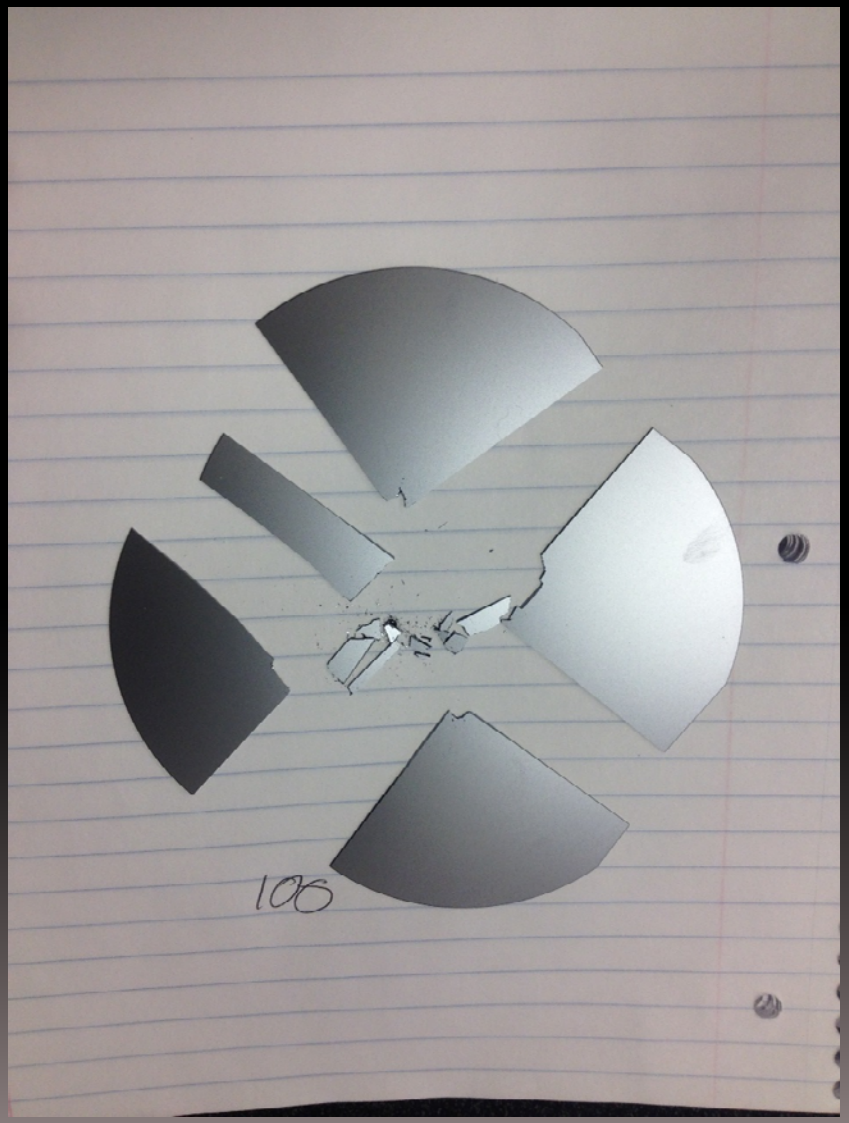
Lab 2 Cont…..



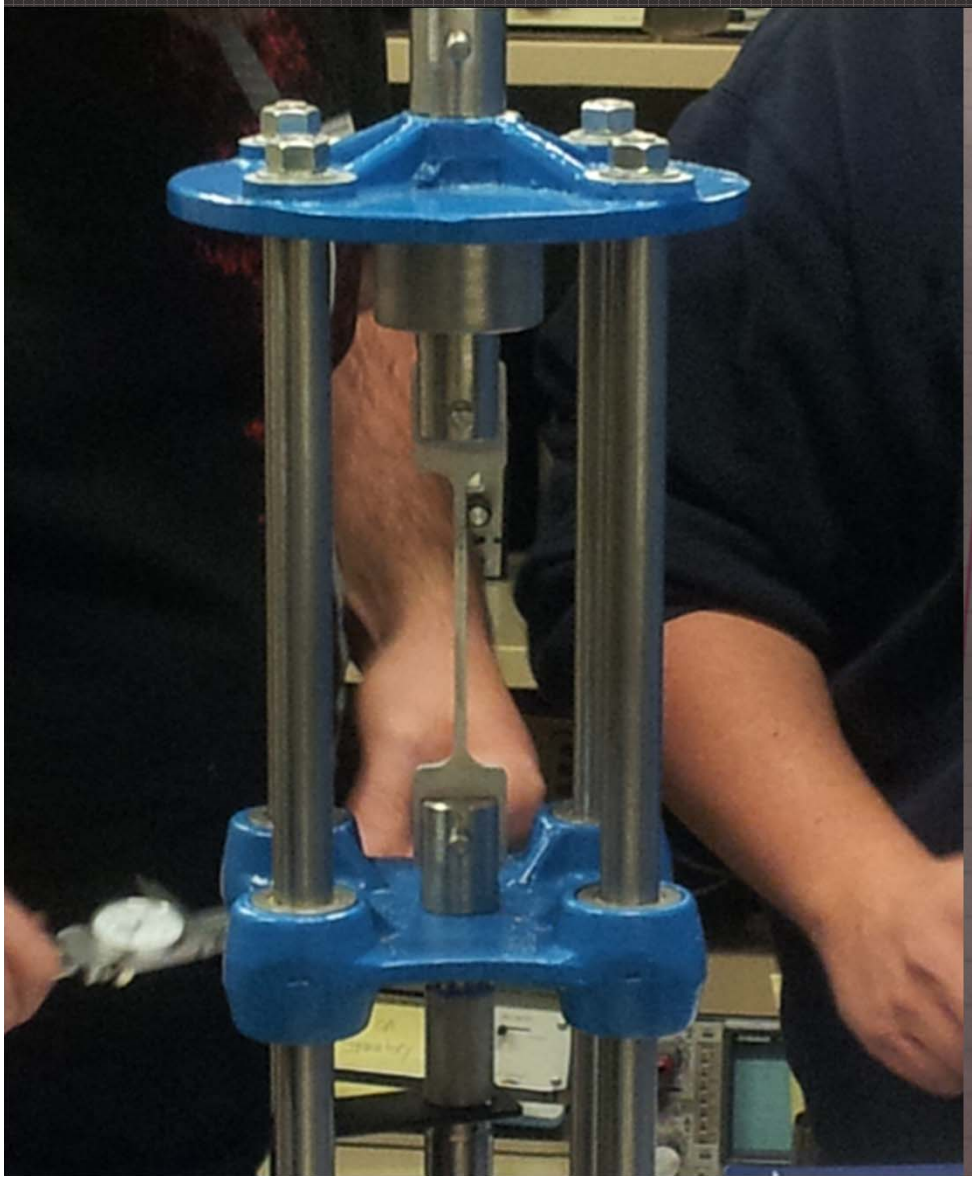


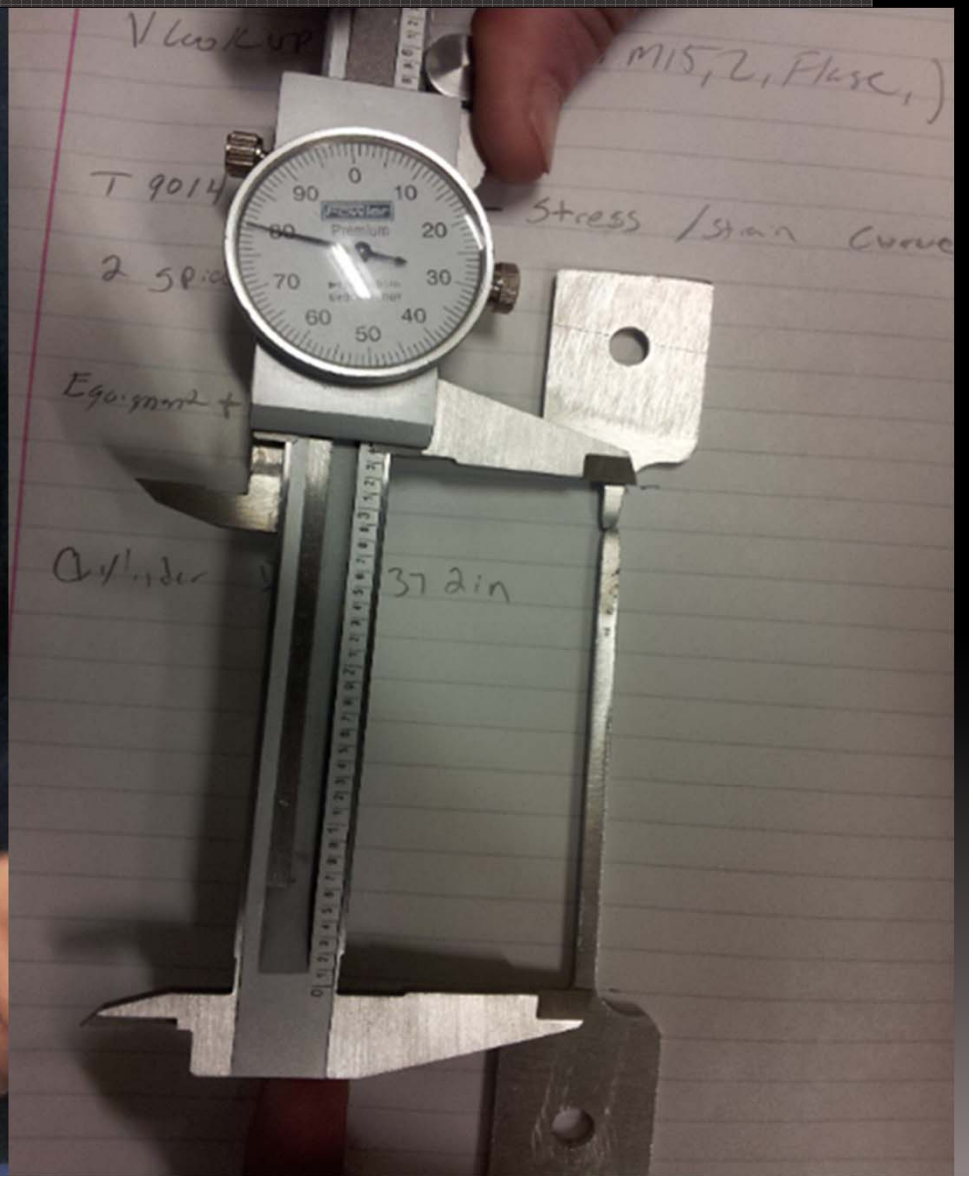

MARK PLUMB CUTS ALONG THIS EDGE
COMPASS
PLUMB CUTS
HIP/VAL
S EDGE



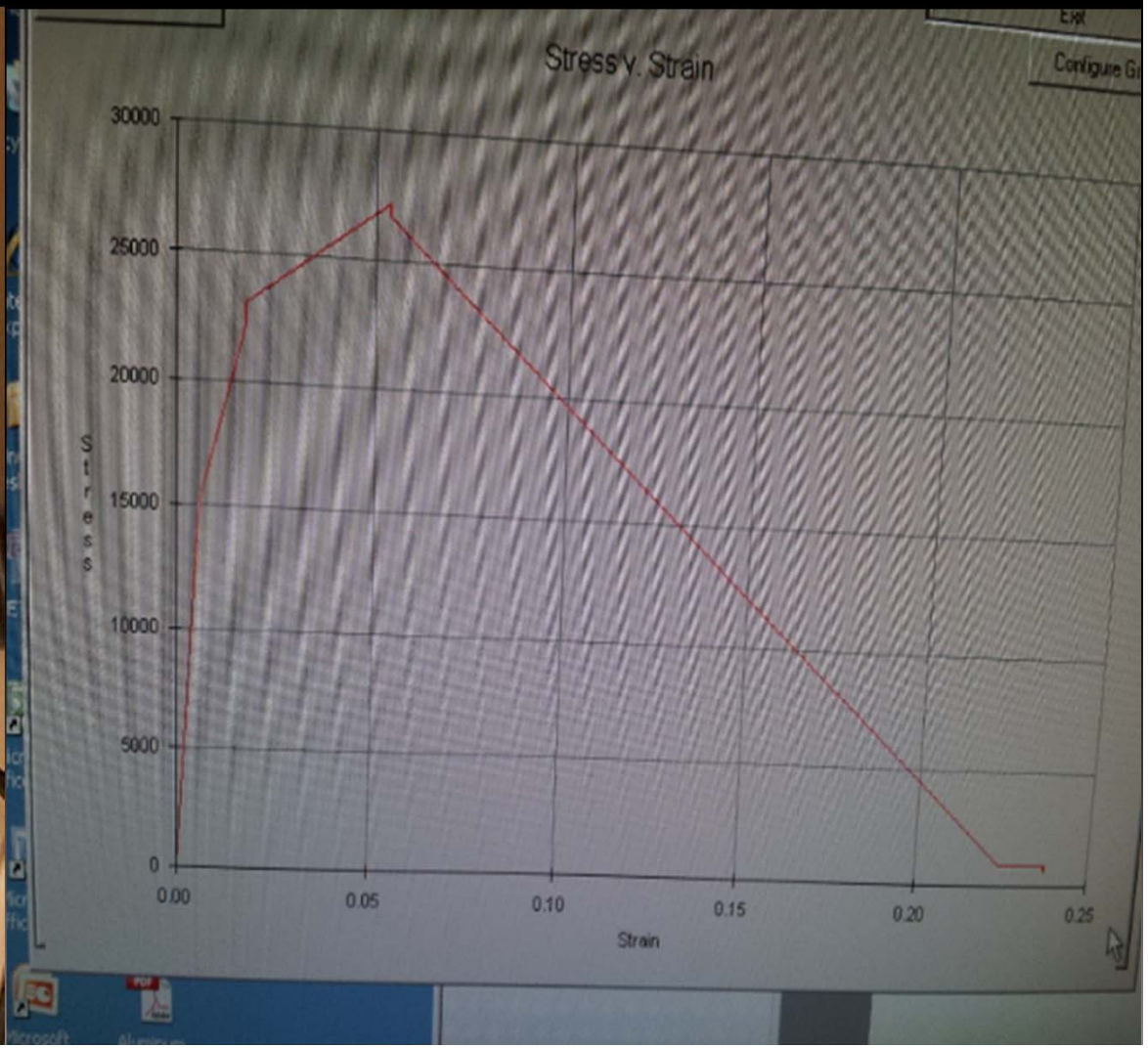

105

Lab 3 T9014 Aluminum





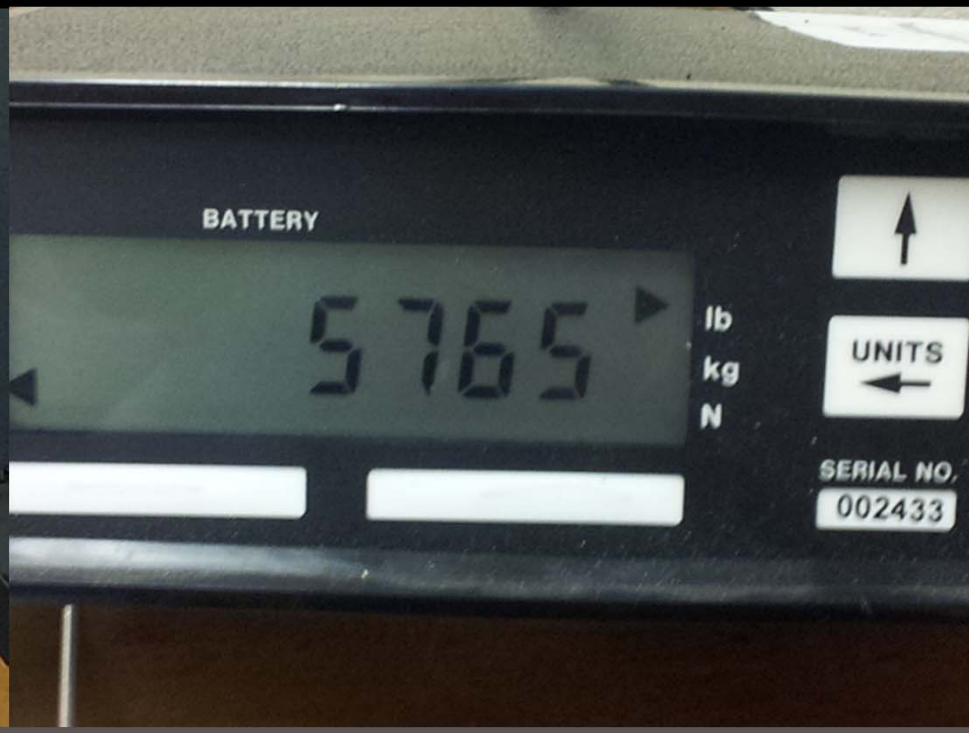
Lab 3 Cont……


Stress v. Strain
30000
25000
20000
15000
10000
5000
0
Stress
0.00
0.05
0.10
0.15
0.20
0.25
Strain

Lab 4: TC1548 Steel Tensile Tester

Lab 4: Cont….


BATTERY
C/ZERO
GROSS
PEAK
CAPACITY
0
lb
kg
N
MENU
GROSS PEAK
UNITS
PRINT SELECT
ZERO CLEAR
SERIAL NO.
002433
MODEL FI-90

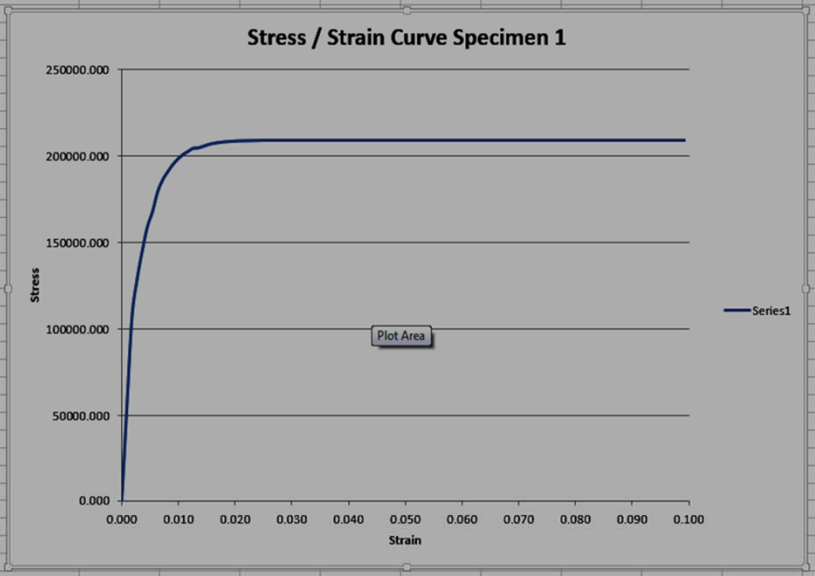

BATTERY
5765
lb
kg
N
UNITS
SERIAL NO.
002433

Lab 4: Cont.….

Lab 4: Cont…

lab 2 speciman 1 steel [Read-Only] - Excel

Length	Force																								
0.002	1520		diameter of neck	0.1875	in																				
0.004	2950		original length	2.216	in																				
0.006	3550		end length	2.413	in																				
0.008	4000		original diameter	0.25	in																				
0.01	4385																								
0.012	4625		Length			Force		CSA			Stress		Strain												
0.014	4940		2.216	in		0		0.027611654	in^2		0.000		0.000												
0.016	5135		2.218	in		1520					55049.219		0.00090253												
0.018	5265		2.220	in		2950					106838.945		0.00180505												
0.02	5380		2.222	in		3550					128568.900		0.00270758												
0.022	5470		2.224	in		4000					144866.366		0.00361011												
0.024	5540		2.226	in		4385					158809.754		0.00451264												
0.026	5590		2.228	in		4625					167501.736		0.00541516												
0.028	5640		2.230	in		4940					178909.962		0.00631769												
0.03	5645		2.232	in		5135					185972.197		0.00722022												
0.035	5710		2.234	in		5265					190680.354		0.00812274												
0.04	5740		2.236	in		5380					194845.262		0.00902527												
0.045	5755		2.238	in		5470					198104.755		0.00992780												
0.05	5760		2.240	in		5540					200639.917		0.01083032												
0.065	5765		2.242	in		5590					202450.746		0.01173285												
0.07	5765		2.244	in		5640					204261.576		0.01263538												
0.08	5765		2.246	in		5645					204442.659		0.01353791												
0.09	5765		2.251	in		5710					206796.737		0.01579422												
0.1	5765		2.256	in		5740					207883.235		0.01805054												
0.11	5765		2.261	in		5755					208426.484		0.02030686												
0.12	5765		2.266	in		5760					208607.567		0.02256318												
0.13	5765		2.271	in		5765					208788.650		0.02481949												
0.14	5765		2.276	in		5765					208788.650		0.02707581												
0.15	5765		2.286	in		5765					208788.650		0.03158845												
0.16	5765		2.296	in		5765					208788.650		0.03610108												
0.17	5765		2.306	in		5765					208788.650		0.04061372												
0.18	5765		2.316	in		5765					208788.650		0.04512635												
0.19	5765		2.326	in		5765					208788.650		0.04963899												
0.2	5765		2.336	in		5765					208788.650		0.05415162												
0.21	5765		2.346	in		5765					208788.650		0.05866426												
0.22	5765	broken	2.356	in		5765					208788.650		0.06317690												
			2.366	in		5765					208788.650		0.06768953												
			2.376	in		5765					208788.650		0.07220217												
			2.386	in		5765					208788.650		0.07671480												
			2.396	in		5765					208788.650		0.08122744												
			2.406	in		5765					208788.650		0.08574007												
			2.416	in		5765					208788.650		0.09025271												
			2.426	in		5765					208788.650		0.09476534												
			2.436	in		5765					208788.650		0.09927798												



Lab 5: Brinell & Rockwell Hardness Testing on Cu/Al

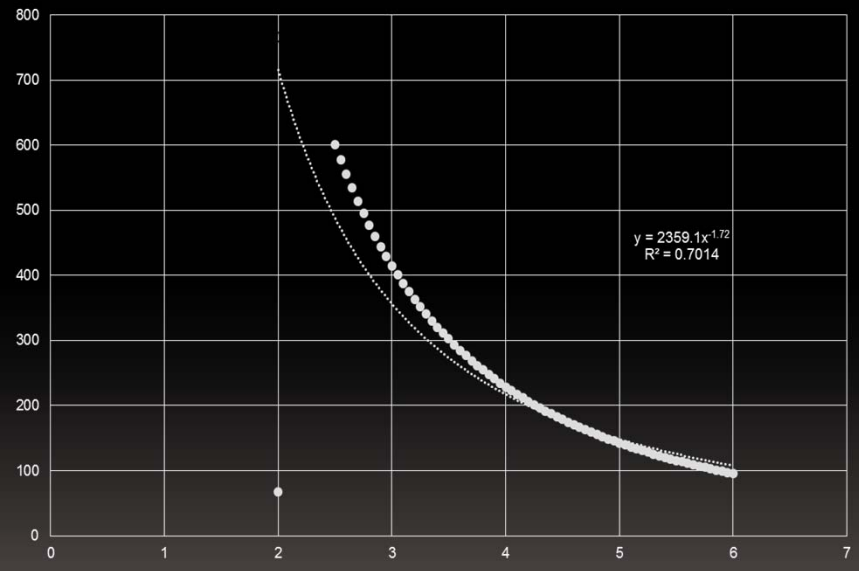
Lab 5: Cont….

Lab 5: Cont… Cu sample

Lab 5: Cont…

Froce	3000	kg
PI()	3.141593	
Diameter	10	mm
d	6.98	mm
HB=	67.27172	

Copper Trend Line

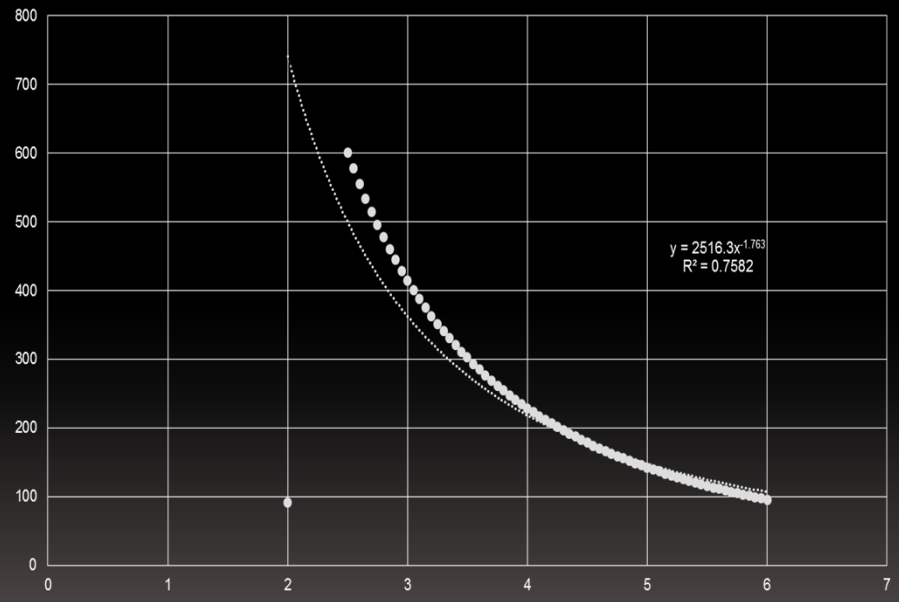


Lab 5: Cont…. Al sample

Lab 5: Cont…

Froce	3000	kg
PI()	3.141593	
Diameter	10	mm
d	6.13	mm
HB=	90.9816	

Al Trend line Curve



Lab 6: Beginning of Pasco Strength Tester

Making our samples

Lab 7: Rockwell Hardness Test of Al, Steel, & Brass