Experiment Six (6)
Hardness Testing

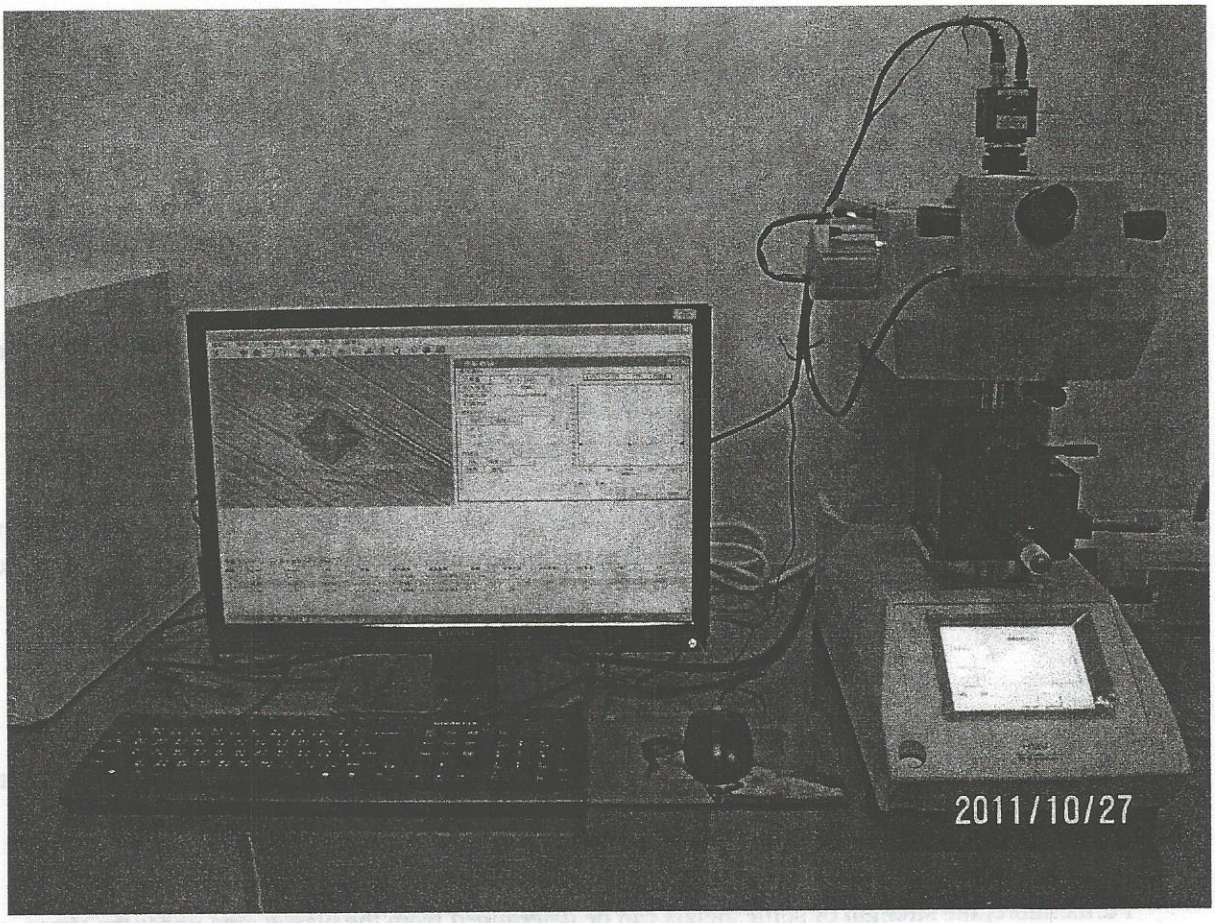
Introduction

Objective:

To Study and evaluation of Surface hardness of different materials using Micro-Hardness testing Equipment, Vicker Methods.

Apparatus:

1. Vivker hardness testing equipment, similar to the model shown.
2. Material Samples, Steel and Aluminum.



The Yield Strength	$\sigma_y = VHN(0.1)^n / 3$
n– Surface exponents	

Procedure

Procedure for microhardness test:

1. Turn on the tester.
2. Select and install the indenter (Vickers), if not already installed.
3. Place the weights selected on the loading pan. The Knob on the side will help to set the loading in Grams unit.
   Pay attention, to the location of the sample 3Dtable and cameras. Use the vertical positioning knob to lower the table from the cameras before using the button selector. The button selector is a Black knob on the front of equipment that switches the cameras of indenter.
4. Place the specimen in the tester, secure and turn the 40× objective lens into place. Focus on the specimen surface with the focusing control until surface features can be seen. Select a clean area of the sample with no prior dent.
5. Gently turn the loading handle clockwise to raise the weights and the indenter, and turn the indenter into place. Slowly release the loading handle counter-clockwise to apply the load. Leave the indenter on the specimen for 10 to 15 s. (in this lab we will be using 15 seconds).
6. Raise the indenter by turning the loading handle clockwise gently, and turn the objective lens back into place.
7. Focus on the specimen surface to view the indentation.
8. Run auto Analysis. On the software selection option.
9. The software will try fit vectors onto opposite nodes of the dent and calculate the diameter of indentations.
10. If the software due to off scale, or not clearly defined edges could pick the right corners, Right Click on the mouse and select the opposite corners of indentations manually.
11. Record these values.
12. (ABOVE): Measure length of the long diagonal both diagonals (Vickers) of the indentation with the scale in the microscope. The numbers on the scale are length measured in 0.001 mm. alternatively, the diagonal lengths can be determined by moving a point on the scale from a corner to the opposite corner of the impression under microscope and noting the difference in micrometer readings (numbers on the fine scale are in 0.01 mm).
13. Calculate microhardness number using the appropriate formula.
14. Vicker testing machine will give you D_1 and D_2 and Microhardness VHP on screen. Record these4 values.
15. Make a copy of your screen by selecting the save image, for future analysis.
16. Repeat at the same force for statistical analysis.
17. Repeat for different force in increment of 50 kgm up to 1000 gm for steel and 600 gm for aluminum.

Sample Data Acquisition form:

Possible Charts and Tables:

A. Observed measurements:

Load (Kg)	Experimental			Corrected Experimental		
	ε_1 (με)	ε_2 (με)	ε_3 (με)	ε_1' (με)	ε_2' (με)	ε_3' (με)
0.5						
1.0						
1.5						
2.0						

B. TABULATION OF LOADS, STRAINS, AND STRESSES:

LOAD (gm)	STRAIN (ε) μ/μ	STRESS (psi) (INCREASING LOAD)	STRAIN (με) (DECREASING LOAD)	STRESS (psi) (DECREASING LOAD)