

MP101 Manufacturing Processes

LAB #2 – Heat Treatment

Name: _____ Lab Section: _____ Date: _____

DEFINITION: Heat Treatment – the controlled heating and/or cooling of materials for the purpose of altering their structure and/or properties.

OBJECTIVE: To familiarize the student with the process of heat treatment by heating a medium carbon steel specimen, then cooling at different rates. The change in mechanical properties will be determined by measurement of hardness and impact toughness.

PROCEDURE:

1. Pre-heat the furnace to ~100°F above the A₃ line.
2. Obtain five Charpy test specimens from your instructor and label them I, O, W, A, and T. (use a file to create notches near one end in order to identify each specimen)

NOTE: I = Initial condition (control sample)
 O = Oil quench
 W = Water quench
 T = Tempered
 A = Anneal

3. Measure the Rockwell hardness (R_A) of each specimen.
4. Place specimens O, W, A, and T in the furnace and heat for ~15 minutes.
5. While waiting perform a Charpy impact test on specimen I.
6. Shut down the furnace. While allowing specimen A to cool in the oven, remove and quickly quench specimens W & T in water and specimen O in oil.

NOTE: Anneal specimen A by allowing the furnace to cool with the door open to ~1000° F, then remove and finish cooling in room air.

7. Clean off carbon from two opposing sides of each specimen and measure the Rockwell hardness.
8. As directed by your instructor, reheat specimen T to 750° F then quench in water.
9. Clean off carbon from two opposing sides of specimen T and measure the Rockwell hardness.
10. Perform a Charpy impact test on each specimen.

TABLE of RESULTS:

Charpy Specimen Material

Marks		HARDNESS (R _A)			Toughness (ft*lb)
		Initial reading	Reading after quench/anneal	Reading after tempering	
0	Initial condition		XXXXXX	XXXXXX	
1	Oil quench			XXXXXX	
2	Water quench			XXXXXX	
3	Temper				
4	Anneal			XXXXXX	

DISCUSSION/ANALYSIS:

Did the results reflect what was expected? Why or why not?

Did the impact strength readings correlate with the hardness readings? How did these relate?

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