Chapter 1: Introduction

	Time	Activity
Day One	7:45am	Transportation pick up at the Biltmore to MJSA
	8:30am –11:30am	Class
	11:30am – 12:30pm	Lunch
	12:30pm – 3:00pm	Class
	3:00pm – 5:00pm	Manufacturer Tour
Day Two	7:15am	Transportation pick up at the Biltmore to MJSA
	8:00am –11:35am	Class
	11:35am – 12:35pm	Lunch
	12:35pm – 5:00pm	Class
	5:30pm	Group Dinner
Day Three	8:00am	Depart from the Biltmore to Manufacturer Tour
	8:30am – 10:30am	Tour
	10:30am – 11:00am	Return to MJSA
	11:00am – 12:30pm	Class
	12:30pm – 1:30pm	Lunch
	1:30pm – 4:30pm	Class
	4:30pm – 5:30pm	Reception

Chapter 3: Raw Materials

In this Chapter

- ✓ *Lanham Act*
- ✓ *Kimberley Process*
- ✓ *PATRIOT Act*
- ✓ *Gold and Silver Stamp Act*
- ✓ *Quality Marks and Trademarks*

Industry Regulation and Guideline Trivia

Notes

Chapter 3: Raw Materials

In This Chapter

- ✓ *Metallurgy Basics*
- ✓ *Metals and Alloys*

The Structure of Metal

***Malleable*: Capable of being shaped or formed.**

***Ductile*: Easily drawn into wire or hammered thin.**

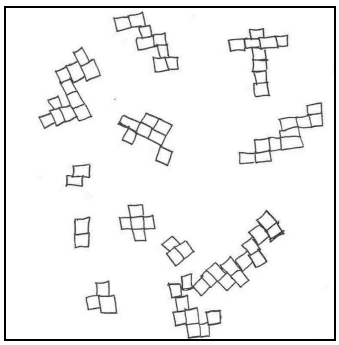
Essay: Metallurgy Basics

At room temperature, metal exists as crystals. The crystals are regularly shaped, and arranged in a somewhat orderly fashion. The pattern in which they are arranged is called a *space lattice*. A space lattice is a three-dimensional arrangement.

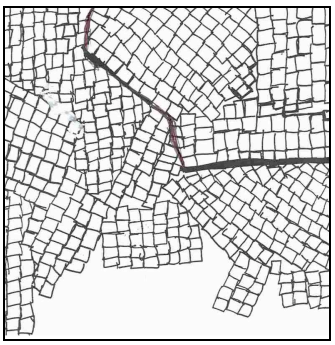
When a metal is heated and becomes liquid, it loses its crystalline organization. When the metal then cools, the crystal pattern reasserts itself. Clusters of crystals will form at the same time, and will bump up against each other, solidifying in different orientations (facing in different directions).

Grain is the general direction of growth within a crystalline structure. (You may know the term "grain" from talking about wood.) When metal cools and re-solidifies, differently oriented crystals cause *irregular grains*. The places where irregular grains meet up are known as *grain boundaries.*

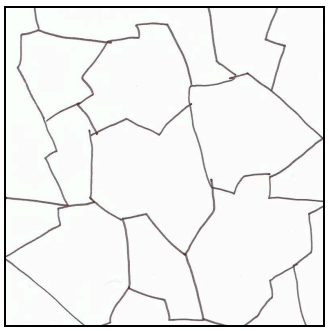
Crystals Forming ***Grain Boundaries***

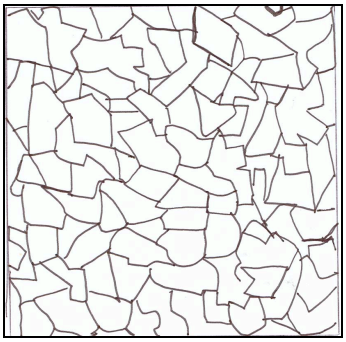


Annealed



Work Hardened





Fun Facts:
Goldsmithing is the art of working with precious metals, including silver and platinum. The word *smith* originates from the word *smite*, which means to hit. A goldsmith is, literally, a gold hitter.

Essay: Metallurgy Basics (continued)

Crystals move more easily when they exist in a fairly orderly structure. But when the crystals are at a grain boundary, they are "caught" and cannot move very freely. The metal is therefore harder at these boundaries.

Sometimes goldsmiths want to harden metal, so they bring about grain boundaries on purpose. Applying force to a metal (by

hammering it, for instance) will cause the large orderly crystals to break into smaller crystals. Those smaller crystals create more grain boundaries. The resulting harder, less malleable, and less ductile metal is referred to as ***work hardened*.**

Another way to harden metal is to cool it rapidly. Because the metal is forced to solidify quickly, the crystals do not have the luxury of time to re-form in an organized lattice. Instead, they form many small grains.

Conversely, if a goldsmith heats a work-hardened metal to a certain temperature (below its melting point) the metal can be made more malleable. ***Annealing*** metal causes vacancies to form, and those vacancies allow the crystals to move around more freely. Annealing also reduces the chance that the piece will crack or break due to the strain on the metal.

How do these processes apply to jewelry? Well, inside a clasp, a spring made of wire should not be soft, or malleable, or it will not spring back into shape. Fortunately, pulling metal into wire is a form of work hardening. Bending the wire into a spring is also a form of work hardening. However, if you were to use a soldering torch near that wire, it might soften/anneal. Then the spring would lose its springiness.

As goldsmiths make a piece, they must take into consideration how their actions affect the metal. Metal that is worked too much will become brittle, and so should be annealed from time to time. Metal that is too soft creates problems too. For instance, a too-soft sheet may cause a stamped piece to have unintentionally beveled or rough edge.

Issues such as strength, brittleness, and malleability will affect the quality and cost of the products you buy.