

Title: Metal Alloys - Designing for Desired Properties

Author: Cathy Smiley

Externship Business: [Waupaca Foundry, Plant 4](#)

Overview / Description:

Students will research various metal alloys used to make automobile products that they use in their everyday life and report their findings on a poster board and collaborate on a discussion board.

Subject(s):

Chemistry in the Community

Grade Level(s):

Grades 10-12

Learning goals/objectives:

After completing this activity, students should be able to:

- Explain the composition of various alloys
- Explain the use and important physical property of an alloy
- Explain why carbon is added to the iron melting process

Type of Activity (check all that apply):

- X Individual
- X Small Group
- X Whole Class

Teaching Strategies (check all that apply or include new strategies):

- X Discussion
- X Partner work
- X Use of Technology
- X Simulation

Content Standards:

Wisconsin Standards for Science

Cross Cutting Concepts:

Standard SCI.CC2: Students use science and engineering practices, disciplinary core ideas, and cause and effect relationships to make sense of phenomena and solve problems.

SCI.CC2.h: Students understand empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.

Model Academic Standards for School Counseling

Academic Development Domain

Content Standard C: Students will understand the relationship of academics to the world of work, and to life at home and in the community.

- Core Performance Standard 1: Understand how to relate school to life experiences.

Length of Time and length of class periods: Three 90-minute class periods.

Materials List:

- Foundry in a Box kit
- Foundry in a Box overview video: <https://youtu.be/p5IBKG3LA70>
- Guest Speaker - Peggy Peterson, human resources at Waupaca Foundry or a guest speaker from a foundry near you
- Poster Board
- Chromebook/Computer
- [Project Rubric](#)
- Ductile Iron resources:
 - [Metallurgy Matters](#)
 - [Grey vs Ductile Iron](#)
 - [Why add Carbon?](#)

Directions (Step-by-Step):

1. In this lesson, students will participate in Waupaca Foundry's "Foundry in a Box" program. A good introduction to "Foundry in a Box" can be found in this Waupaca Foundry video: <https://youtu.be/p5IBKG3LA70>. Teachers located in areas outside of Marinette County, WI can contact a foundry near them to see if this program is available in their area.
2. Peggy Peterson from Waupaca Foundry or other foundry personnel will come in to discuss the ductile steel process from raw product to finished product.
3. Student will pair up to research three different matrices of ductile iron and report their findings on a poster board. Types of ductile iron include:
 - Ferrite

- Pearlite
 - Pearlite/Ferrite
4. Students' poster board reports should include:
- Which alloy components are present in their specific ductile iron
 - What their ductile iron is used for
 - The importance of the alloy mixture in their ductile iron
5. The following resources can be shared with students as they begin their research:
- [Metallurgy Matters](#)
 - [Ductile Matrices](#)
 - [Grey vs Ductile Iron](#)
 - [Why add Carbon?](#)
6. Student pairs will report out (to teacher) their findings for understanding check (formative assessment.)

Wrap-Up:

7. After incorporating any feedback from the teacher, students will present their findings on their poster boards to the class (summative assessment).
8. Students will give a summary of their alloy on a discussion board (summative assessment) and respond to one other student. This will be used as a summative assessment to check for mastery of the three objectives.

Formative/Summative Assessment:

- Formative assessment: Pair-share with other students on similarities and differences of each others alloys.
- Summative assessment: Poster presentation and discussion board summary of their research with response to other students. [Project Rubric](#)

Extension Activity for differentiation:

- Students will investigate the importance of graphite addition in the ductile iron process.

OER Commons License:



Metal Alloys by Cathy Smiley is licensed under a [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License](#).

Ductile Iron Project Rubric

Category	4	3	2	1
Originality	Presentation shows considerable originality and inventiveness. The contents and ideas are presented in a unique and interesting way. Good use of visuals.	Presentation shows some originality and inventiveness. The content and ideas are presented in an interesting way. Some visuals.	Presentation shows an attempt at originality and inventiveness. Visuals are present but not relevant.	Presentation is a rehash of other people's ideas and/or graphics and shows very little attempt at original thought. No visuals.
Content-Accuracy	All content throughout the presentation is accurate. There are no factual errors.	Most of the content is accurate, but there is one piece of information that might be inaccurate.	The content is generally accurate, but one piece of information is clearly flawed or inaccurate.	Content is typically confusing or contains more than one factual error.
Effectiveness	Project includes all material needed to gain a comfortable understanding of the topic.	Project includes most material needed to gain a comfortable understanding of the topic, but is lacking one or two key elements.	Project is missing more than two key elements.	Project is lacking several key elements and has inaccuracies.
Sources	Source requirement (4) has been met and information is presented in correct MLA format.	Minimum source requirement met. Most sources are documented in MLA format.	Source information was collected but not in MLA format.	Very little or no source information was collected.

Name: _____

Title: _____

Projected Timeline:

Project title: May 6, 2019

Project outline: May 13, 2019

Project presentation: May 20, 2019

Project objectives: Students will research a ductile iron or a grey iron process and product related and present using informational strategies. Students should have an accurate understanding of the information that they are presenting.

Media: PowerPoint, Promethean, movie, poster board, album, or approval from Mrs. Smiley.