

### Introduction

The manipulation of glass-like rocks and ceramics represent humans' earliest materials innovations. This module examines the process and social impacts of shaping rock and clay, and uses these lessons to explore the possibilities for manipulating tomorrow's functional ceramics. The creation of new processing approaches allows us to take advantage of different properties of a material, giving us insights into how we might rethink traditional approaches to dealing with materials corrosion.

### Module Objectives

Students will:

- identify the properties of ceramics
- describe the work of materials processing
- discover the uses and applications of ceramics both historically and in modern times
- examine how the physical processing of a material involves social acts
- discover the hidden costs of increasing materials manufacturing.

### Readings, Lecture, and Practice

Watch the Lecture: [Ceramics and Glass\(22:00\)](#)

Read: “Firing Clay, Breaking Glass, and the Past Futures of Ceramics” by Kenneth Sassaman

*To prepare for your quizzes and exams, take notes and think about how the lecture content relates to your readings as you watch the lecture.*

Practice: [Take the Ceramics and Glass Quiz](#)

*The practice quiz has 10 questions. You will have 90 seconds to complete each question. You may only take the practice quiz one time and you must finish it once you open it so be sure you have adequately prepared by **taking notes** while you watched the lecture, and by reading the chapter and by studying before you begin. Your notes will be very useful for when you study for Exam 1 and 2.*

### Assignment: Application Video Analysis

**Key Concept:** Certain ceramics have the ability to transduce energy from one form to another. For example, piezoelectrics have the ability to convert mechanical energy to electrical energy and vice versa. Magnetic nanoparticles have the potential to not only diagnose diseases like cancer but off the possibility to treat these diseases. As we learned from looking at the “Past Futures of Ceramics” in the textbook reading, however, every decision we make when engineering a material reveals and constrains its possible uses. So, as you explore the fascinating world of functional ceramics in this video, think about how advances in engineering will continue to open new horizons for this versatile material.

## Module 3: Glass and Ceramics

### Assignment Instructions:

Before the video reflect on the lessons of this unit by considering the questions below. As you watch the video, think about how each question is answered.

- What do we mean by functional ceramics?
- What are the properties of ceramics that enable them to be "functional"?
- What are the parallels between creating a process to make modern functional ceramics and to make early ceramics?
- What are some ways magnetic nanoparticles are being used to treat cancer?
- Investigate how a thermoelectric material works and discuss how it might be used.

Watch: [Ceramics \(9:45\)](#)

**Write a 1-page essay** synthesizing the answers to the questions above with what you've learned in the lectures and readings. *(full sentences in paragraphs, double-space, 11-12 pt. font).*

This assignment will be graded out of 20 points on effort, use of the lecture, video, reading materials, and thoughtful reflection. See the rubric attached to this assignment for grading criteria. Be sure your name is on the paper. A cover page is not necessary.

Refer to the due dates document for submission dates and the assignment rubric for grading criteria.

### Application Video Analysis Rubric

Criterion	9-10 points	6-8 points	3-5 points	0-2 points
Response Content (10 Points)	Responses are appropriate, thoughtful, and indicate engagement with the video.	Responses have minor inconsistencies with the video or are not supported by content.	Responses have major inconsistencies with the video or are not supported by content.	Responses are inaccurate, careless, and/or opinions are not supported by content.
Mechanics (10 Points)	Grammar, sentence structure and punctuation are correct and paper is properly cited.	Minor issues with grammar, punctuation and/or sentence structure and citations.	Significant issues with grammar, punctuation and/or sentence structure and citations.	Major issues with grammar, punctuation and/or sentences and citations
Total				

**Assignment: Material Entanglement and Impact Paradigm Reflection**

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Humans and things develop interdependencies (entanglements) that trap them and constrain or limit their actions. The entanglement model developed by Ian Hodder is a method for analysis: humans depend on things, things depend on other things, things depend on humans; thus, humans depend on things that depend on other things and on humans.

### Part 1 Instructions:

- **Open** your Material Entanglement Reflection Document created in Module 2.
- **Label** this new entry with this module's material and the date at the *top* of the page. (*Example: 1/23/16 Module 15: Diamonds*)
- **Create** a tanglegram that illustrates your relationship with the material from this module. (\*If this module covered more than one material, then choose just one to explore your entanglement.)
  - Refer to the example tanglegram in the Module 2 reading, *Entanglement of Earth*. Make sure that this tanglegram demonstrates the new information about the relationship of materials to society that you learned in this lesson (e.g., our dependence on trade to acquire materials)
  - *Note that you may hand draw your tanglegram and take a picture to insert in your document or use any other type of application that suits you. There are many free concept mapping applications found online. Just search mind-mapping applications.*
- **Add your new tanglegram** under your new entry heading.
- **Source an image** that illustrates an aspect of your entanglement (or supports your lack of entanglement) with the material from this module. The image can be found, created, or photographed. If the image isn't yours, be sure to include a reference.
- **Add your sourced image** under your tanglegram.
- **Caption** the image telling what it is and its context.
- **Discuss** your thoughts related to your personal relationship with this material and how that relates to society.
  - Consider:
    - How do the social and cultural properties of this material affect you and society?
    - Based on what you've learned about this material, what might be the consequences of the corrosion, degradation, or scarcity of this material?

*Note: Your entry should be no more than two paragraphs. Entries are evaluated for content, thoughtfully supported writing, and mechanics. Refer to the *Physical and Social Properties of Matter* document to guide your discussions.*

### Part 2 Instructions:

- **Open** your Impact Paradigm Document
- Add at least one question to any one of the categories. If you're having trouble coming up with a new question, think about the particular case studies of the material in this module, and the

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new information that you've learned about the relationships between materials and society. What is one new way to think about the social life of materials that you learned in this module?

- Submit BOTH your Material Entanglement Reflection Document AND your Impact Paradigm Document

Refer to the DUE DATES document for submission dates and the rubric below for grading criteria.

### Material Entanglement and Impact Paradigm Reflection

Criterion	9-10 points	6-8 points	3-5 points	0-2 points
Response Content (10 Points)	Responses are appropriate, comprehensive, and indicate thoughtful engagement with the information and concepts from the lecture, readings, and videos. Novel ideas, creativity, and attention to complexity are a plus. Tanglegram is fully supported by responses and image.	Good effort. Responses and arguments are not as clearly presented, or as comprehensive and thoughtful as in a full credit answer. Tanglegram is fully supported by responses and images.	Responses are less appropriate to the assignment, less thoughtful and engaged, with less complete information. Tanglegram is partially incomplete or unrelated to images and responses.	Responses are inaccurate, careless, and/or opinions not supported by content. Tanglegram is incomplete.
Mechanics (10 Points)	Grammar, sentence structure and punctuation are correct. Works are cited properly when appropriate.	Occasional grammar or mechanics issue or works are cited incorrectly.	Some issues with grammar, punctuation and/or sentence structure or chosen image or other works are not cited when appropriate.	Major issues with grammar, punctuation and/or sentences. Chosen image or other works are not cited when appropriate.

### Additional Resources

- Whitaker, John C. (1994) Flintknapping: Making and Understanding Stone Tools. Austin: University of Texas Press. c. Flintknapping video with Dr. Bruce Bradley  
<https://www.youtube.com/playlist?list=PL0eIAcNeLAlnJGtIRDW4Uj0J7M7Ct54Kb>
- [Fuel from the Air: Sossina Haile at TEDxBermuda](#)