

Objective:

1. Students will be able to determine the best material for a given product description using Ashby diagrams to assist in the selection process
2. Students will be able to determine design constraints based on a prompt
3. Students will be able to compare two material selections based on eco-friendly considerations
4. Students will be able to justify their decisions in both cases using the knowledge they have gained over the course of the outreach activities and their own life experiences with materials.

Topics covered:

- Material property comparison
- Tradeoffs during engineering design
- Sustainable material selection
- Meeting stakeholders' needs during design

Estimated Time for Activity:

Approximately 15-20 minutes

Supplies Needed:

1. Design prompts (found in Activity Handout)
2. Ashby plots, spaced by material class. Plots made using the Granta CES Edupack software
 - (a) Embodied Energy
 - (b) Price
 - (c) Maximum Service Temperature
 - (d) Strength (Yield Strength/Density)
 - (e) Ability to Resist Fracture (Fracture Toughness/Density)

Prep:

Print enough copies of Sustainability handout prompts and Ashby plots so each group has copies to look at.

Recommended Prior Knowledge for Instructors:

- Materials selection
- Life cycle of materials and its ecological implications

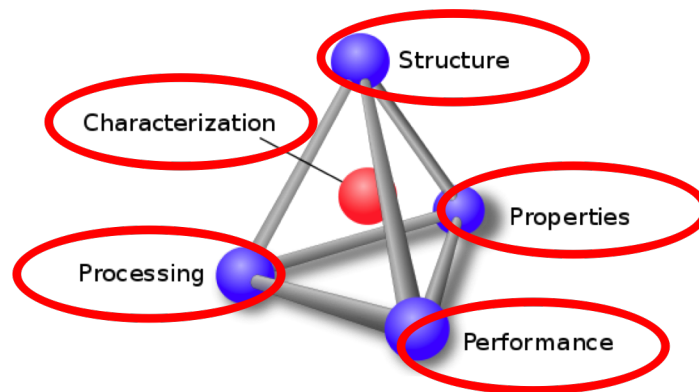
Recommended Prior Knowledge for Students:

- Basic understanding of different material classes and their ability to be recycled

Discussion Points for Instructors

- What materials have you seen in similar applications in real life?
- Which of your constraints would you rank as the most important?
- Are there other constraints you would consider when designing this product?

Aspects of Materials Science Tetrahedron Covered in Module:



Complimentary Modules

- Introduction
- Celebrity Ashby Plot Activity

Files Needed:

- Sustainability Lecture (PPT or pdf)
- Sustainability Lecture Notes
- Sustainability Activity Handout
- Sustainability Ashby Plots

For K-12 Instructors:

Assessment Ideas

- Utilize a word cloud through PollEverywhere – ask “What was the most interesting thing you learned?”
- Have students think of other objects in their life that might benefit from an eco-friendly material update

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