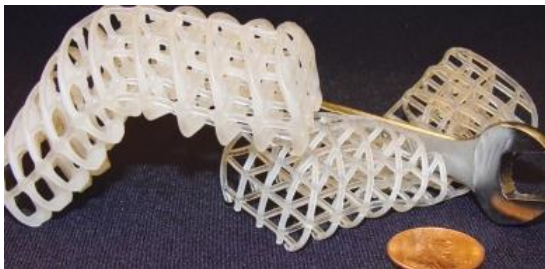
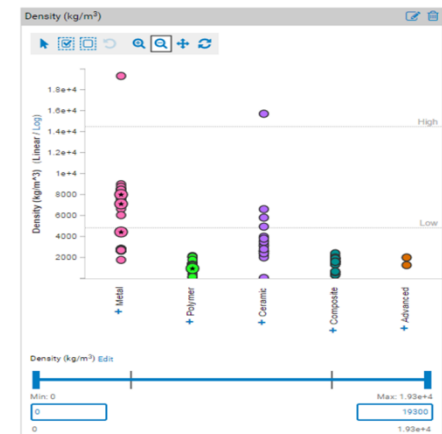


DataVis<sup>™</sup>  
Material Properties  
by ACCESS Engineering



[www.AccessEngineeringLibrary.com](http://www.AccessEngineeringLibrary.com)



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**Begin your project- pg. 5-6**

**Compare a single property – pg. 7-8**

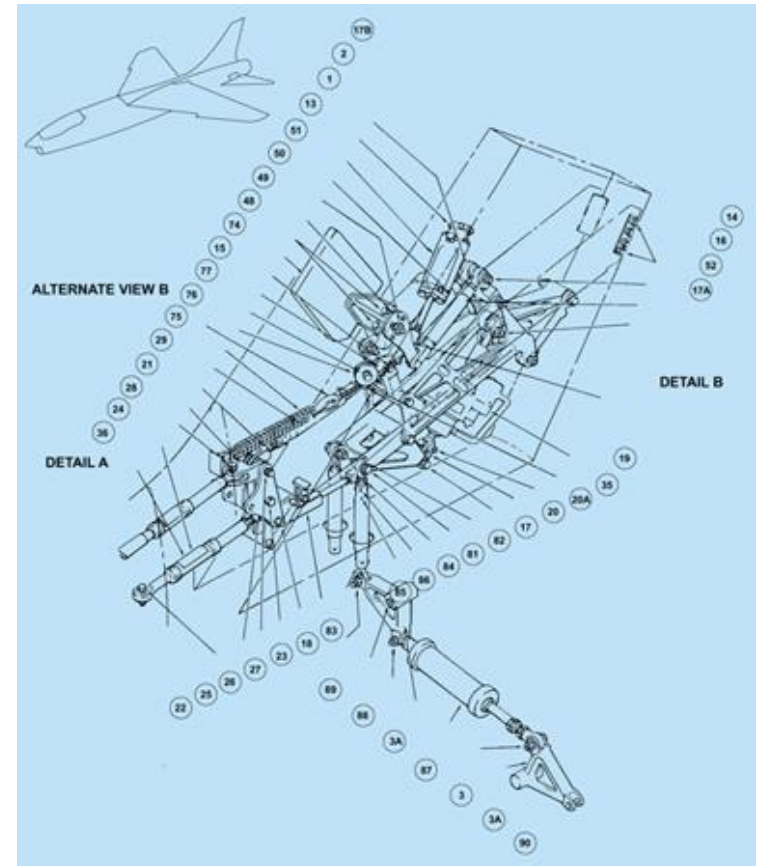
**Compare two properties – pg. 9**

**Dashboard functionalities – pg. 10- 17**

**Search for a property value of a single material – pg. 18-20**

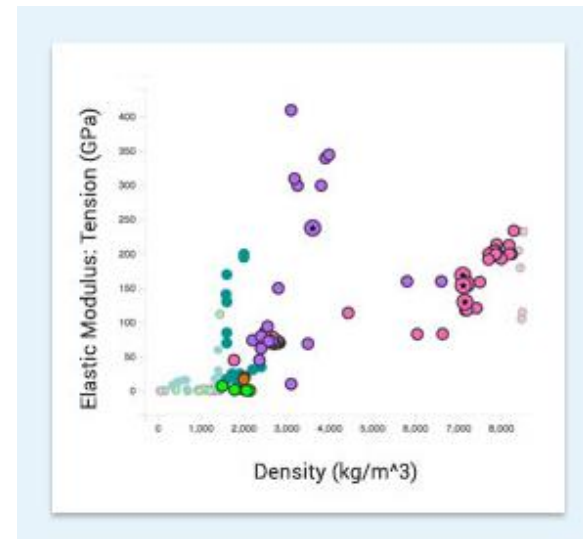
**Sample DataVis projects – pg. 21-22**

**Questions – pg. 23**



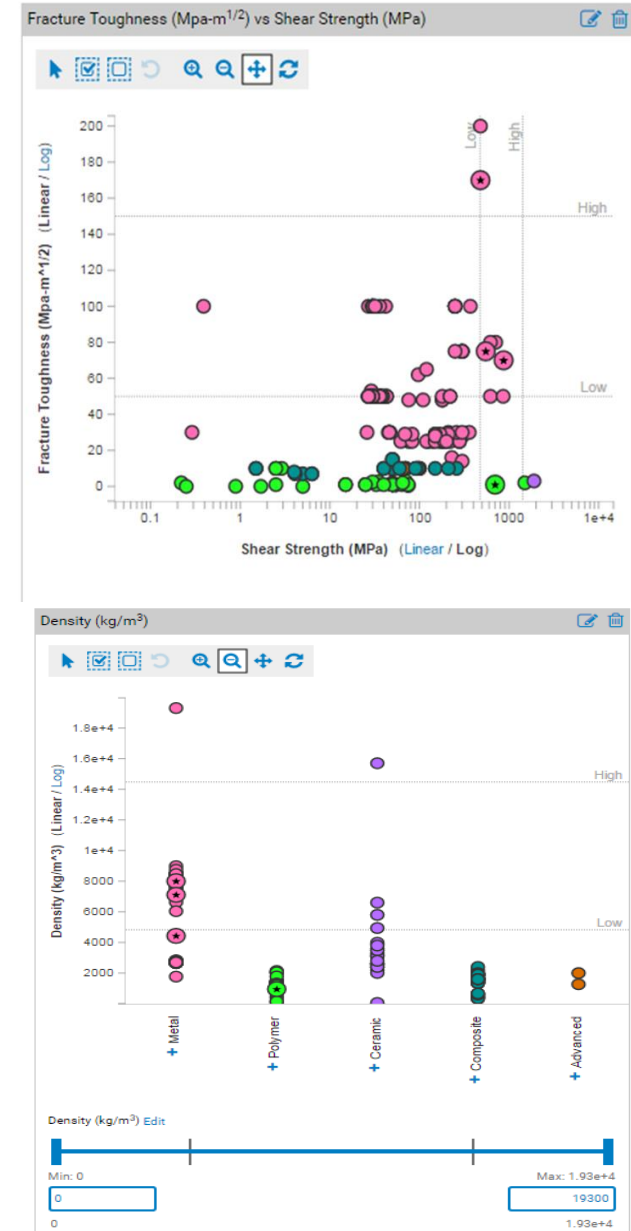
## What is DataVis?

- DataVis is an interactive, web-based data visualization tool that transforms the way students learn about material properties.
- Users can instantly visualize property data in interactive dot-plots and scatterplots across a wide range of materials.
- DataVis includes a curated dataset of 200 materials and 65 properties



# Dot plot and Scatter plot visualizations

- Compare materials for a single property in a dot plot or compare two properties against each other in a scatterplot
- On the right you can see the density of all 200 materials being compared against each other, as well as Fracture Toughness vs. Shear Strength
- Compare up to five visualizations in a page



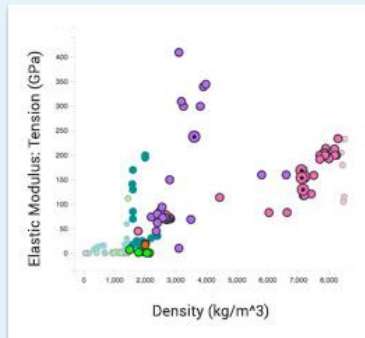
# Begin your DataVis project

DataVis  
Material Properties

ACCESS Engineering

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Home My Projects



Use **DataVis** to visually explore materials and their properties.

Find and compare material property data, then save your interactive visualizations and share with others.



Compare properties across multiple materials



Find a property value for a single material

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[Open Project](#)

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[Open Project](#)

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This project investigates the influence of material properties in basic analysis and design for a first course in Strength of Materials. *Designed by Luke Lee, University of the Pacific.*

[Open Project](#)


# Choose a visualization

Choose visualization

Cancel



**One Property**  
 Dot plot visualization



**Two Properties**  
 Scatter plot visualization

**Tabular Data** (advanced option)

# Compare a single property

Choose Property
Cancel

Enter a property

- Physical
- Mechanical
- Thermal
- Electrical
- Magnetic
- Optical
- Cost

Lets choose Density as an example to begin a project

Choose Property
Cancel

Enter a property

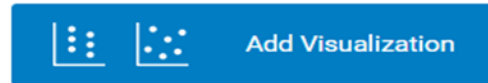
Physical

- Bulk Modulus
- Density
- Elastic Modulus: Compression
- Elastic Modulus: Tension
- Poisson's Ratio
- Shear Modulus
- Specific Gravity
- Tensile Creep Modulus: 1000 hours
- Tensile Creep Modulus: 1 hour



# Density dot plot incorporated into project

Project 8.18.2016 [Add Description](#)  
Hide Page Navigation ▾



**Select Materials** 189 selected

Enter a material or classification

Expand All Deselect all shown

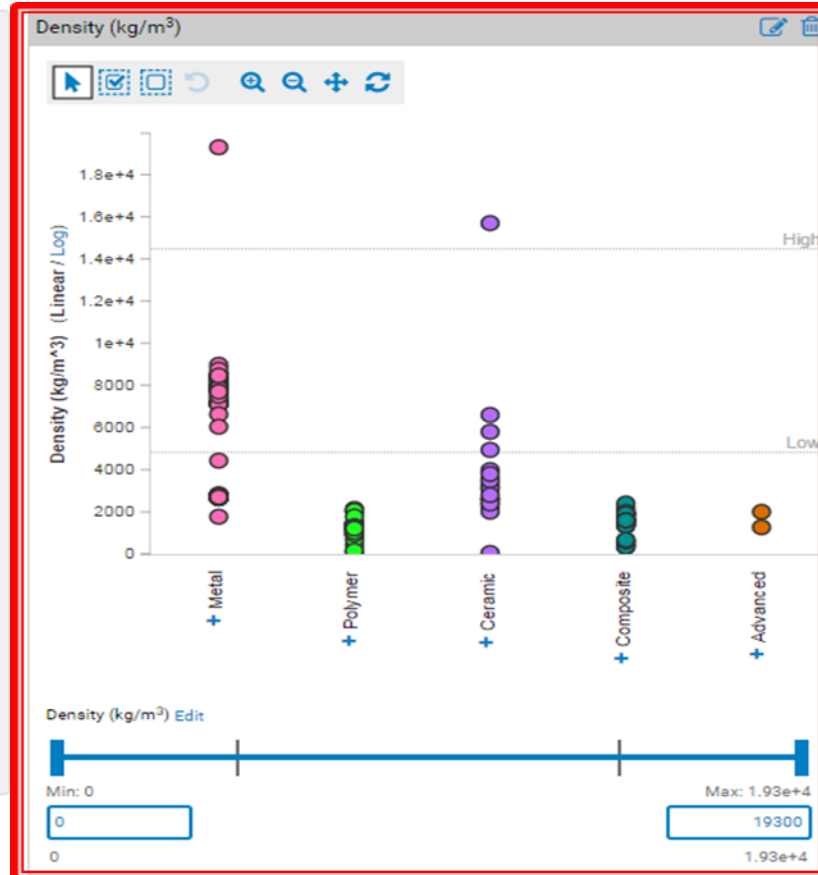
- ▶ Metal (96) ☒
- ▶ Polymer (32) ☒
- ▶ Ceramic (28) ☒
- ▶ Composite (31) ☒
- ▶ Advanced (2) ☒

**Display Settings**

☒ Show all included  
☐ Show selected and in range only  
☐ Show starred only

[More Settings](#)

**Related Content** [Add Related Content](#)





# Compare two properties

Project 8.29.2016 Add Description  
Hide Page Navigation

## Compare Shear Strength vs. Fracture Toughness

Save

Share

Export Page

New

Density



Scatter plot incorporated into project



Add Visualization

Density Add Description

View Tabular Data

### Select Materials

189 selected

titanium Clear

Collapse All

Deselect all shown

▼ Metal (1)

▼ Non-Ferrous (1)

▼ Titanium Alloy (1)

▼ Cast (1)

★ Titanium: Ti-6Al-4V

▼ Ceramic (1)

▼ Technical (1)

▼ Carbide (1)

☆ Titanium Carbide (TiC)

### Display Settings

☒ Show all included

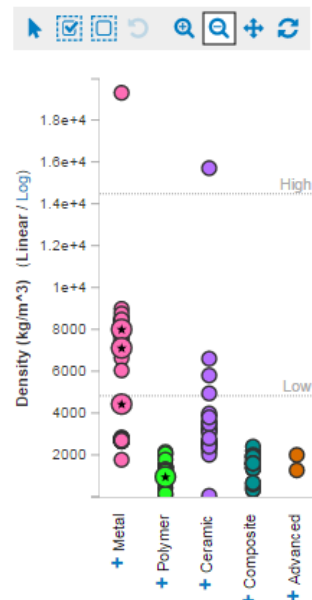
☐ Show selected and in range only

☐ Show starred only

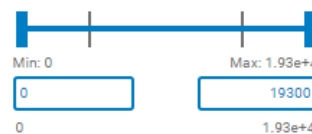
More Settings

Related Content Add Related Content

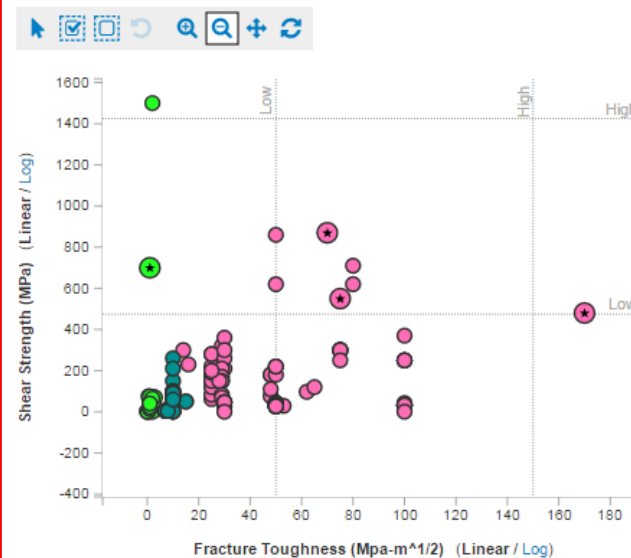
Density (kg/m<sup>3</sup>)



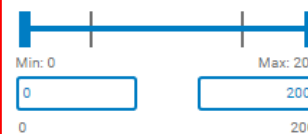
Density (kg/m<sup>3</sup>) Edit



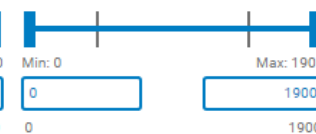
Shear Strength (MPa) vs Fracture Toughness (Mpa-m<sup>1/2</sup>)



Fracture Toughness (Mpa-m<sup>1/2</sup>) Edit



Shear Strength (MPa) Edit



# Tools & Settings

**Project 8.18.2016** [Add Description](#)  
[Hide Page Navigation](#)

← Name your project and add a description

< **Density of materials** + ← Add pages to your project

[Add Visualization](#)

**Density of materials** [Add Description](#) ← Name the page and add a description

**Select Materials** 189 selected

Q Enter a material or classification

Expand All Deselect all shown

- ▶ Metal (96) ☒
- ▶ Polymer (32) ☒
- ▶ Ceramic (28) ☒
- ▶ Composite (31) ☒
- ▶ Advanced (2) ☒

**Display Settings**

☒ Show all included  
☐ Show selected and in range only  
☐ Show starred only

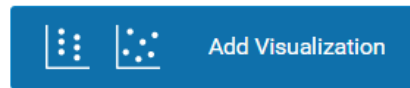
[More Settings](#)

**Related Content** [Add Related Content](#)

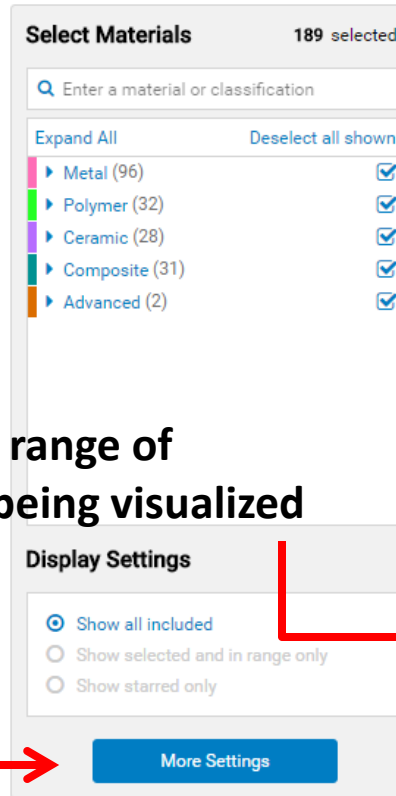


# Additional Tools & Settings

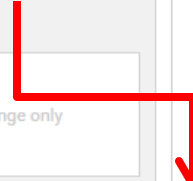
Add up to five visualizations in a page



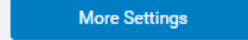
Look up selected materials



Adjust the range of materials being visualized



More settings



Add related content (can be non McGraw-Hill materials)

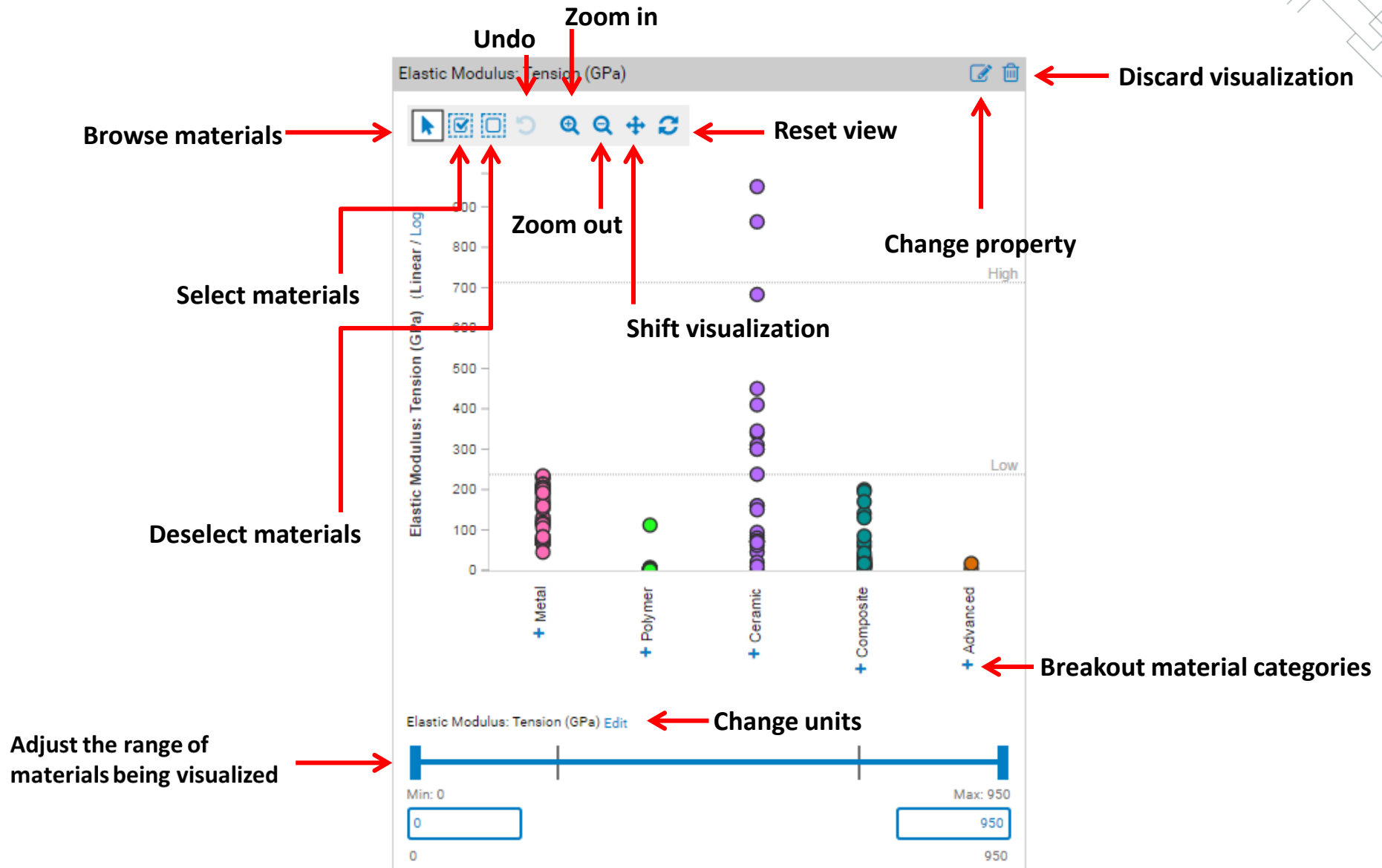


Related Content [Add Related Content](#)



Visualization tools

# Visualization Tools



# Search for a material

## Search for Iron materials

**Select Materials** ↓ 189 selected

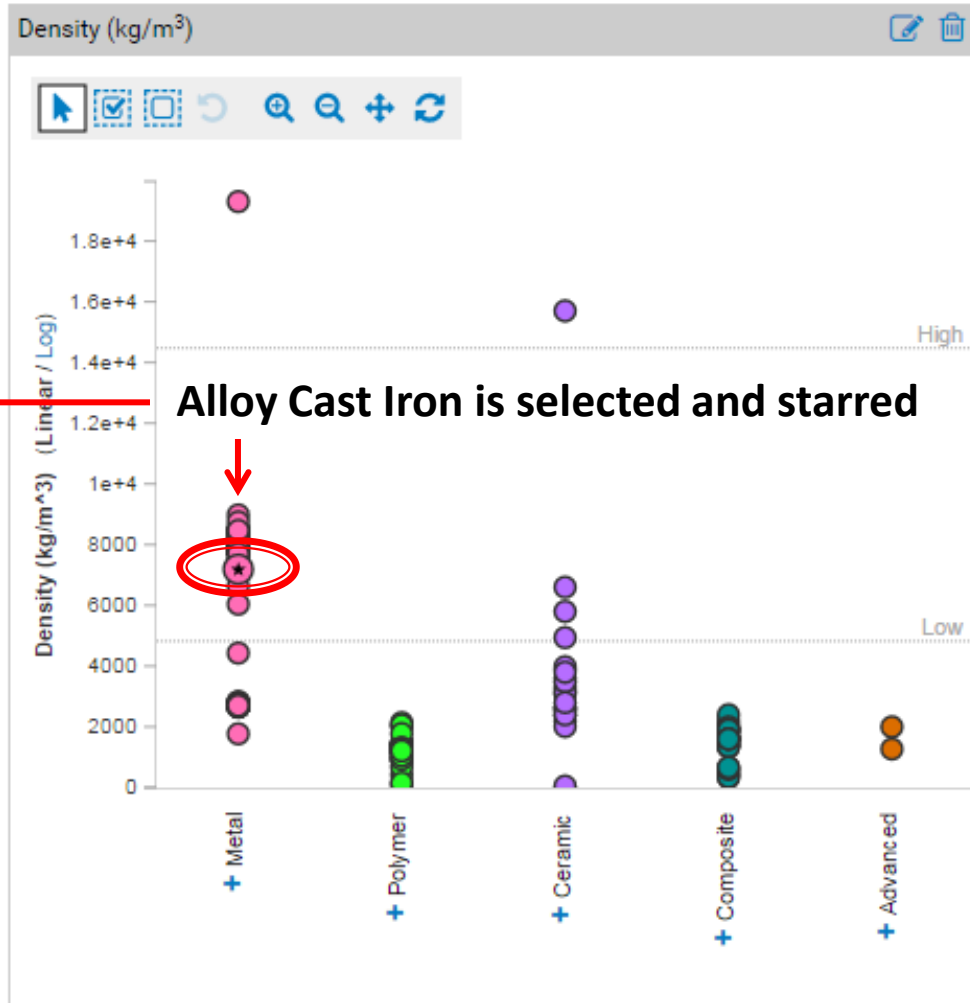
Search: Iron Clear

Collapse All Deselect all shown

- ▼ Metal (12) [✓]
  - ▼ Ferrous (12) [✓]
    - ▼ Iron (12) [✓]
      - ▼ Cast (11) [✓]
        - ★ Alloy Cast Iron Overview [✓] ←
        - ▼ Gray (4) [✓]
          - ☆ Gray Cast Iron: ASTM A48, Class 40 [✓]
          - ☆ Gray Cast Iron: Automotive: SAE J431, SAE G1800 [✓]

**Display Settings**

☒ Show all included  
☐ Show selected and in range only  
☐ Show starred only ←



Option to display only starred materials

# Analyze Tabular Data

View the full list of materials being visualized

Export the full list to a CSV

Tabular Data								Export CSV
Select	Range	Star	Material	Classification	Density (kg/m <sup>3</sup> )	Fracture Toughness (Mpa-m <sup>1/2</sup> )	Minimum Service Temperature: Air (°C)	Maximum Service Temperature (°C)
<input type="checkbox"/>	In	☆	Acetal Copolymer	Polymer	1420	1	-40	110
<input type="checkbox"/>	In	☆	Acrylonitrile Butadiene Styrene (ABS): Molded	Polymer	1060	2.5	-50	93
<input checked="" type="checkbox"/>	In	☆	Alloy Cast Iron Overview	Metal	7190	80	-35	650
<input checked="" type="checkbox"/>	In	☆	Alumina (Al <sub>2</sub> O <sub>3</sub> ): 96%	Ceramic	3800	4.5	-273	1600
<input checked="" type="checkbox"/>	In	☆	Alumina (Al <sub>2</sub> O <sub>3</sub> ): 98%	Ceramic	3900	3.8	-273	1700
<input checked="" type="checkbox"/>	In	☆	Alumina (Al <sub>2</sub> O <sub>3</sub> ): Sapphire: MarkeTech, Single Crystal	Ceramic	3980	7.5	-273	1800
<input checked="" type="checkbox"/>	In	☆	Alumina Oxide - Silicon oxide (3(Al <sub>2</sub> O <sub>3</sub> )-2(SiO <sub>2</sub> )): Mullite	Ceramic	2800	3.0	-273	1600
<input checked="" type="checkbox"/>	In	☆	Aluminum: 1100-H14	Metal	2710	25	-273	640

# More Settings

Choose either Standard  
or U.S. format units

Show or hide  
reference lines for  
visualizations

Adjust range settings

Analyze tabular data

## More Settings

### Display Settings

Default Units: ☒ S.I. ☐ U.S. [i](#)

Reference Lines: ☒ Show ☐ Hide [i](#)

### Property Range Settings

Density



### Tabular Data for All Properties in Project

[Export CSV](#)

Select	Range	Star	Material	Classification	Density (kg/m³)
<input checked="" type="checkbox"/>		<input type="checkbox"/>			
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Acetal Copolymer	Polymer	1420
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Acrylonitrile Butadiene Styrene (ABS): Molded	Polymer	1060
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Alloy Cast Iron Overview	Metal	7190
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Alumina (Al2O3): 96%	Ceramic	3800
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Alumina (Al2O3): 98%	Ceramic	3900
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Alumina (Al2O3): Sapphire: MarkeTech, Single Crystal	Ceramic	3980
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Alumina Oxide - Silicon oxide (3(Al2O3)-2(SiO2)): Mullite	Ceramic	2800
<input checked="" type="checkbox"/>	In	<input type="checkbox"/>	Aluminum: 1100-H14	Metal	2710



# Add Related Content

**Add Visualization**

**Select Materials** 189 selected

Enter a material or classification

Expand All Deselect all shown

- Metal (96) ☒
- Polymer (32) ☒
- Ceramic (28) ☒
- Composite (31) ☒
- Advanced (2) ☒

**Display Settings**

☒ Show all included  
☐ Show selected and in range only  
☐ Show starred only

[More Settings](#)

**Density** [View Tabular Data](#)

The overall weight of any aerospace structure (airplanes, drones, satellites) determines how efficiently it will operate over its lifetime. The weight of its structure determines how much weight can be transported and for how long or far (distance). So thinking about weight brings us to thinking about density, although they are not the same. The weight of a part is a function of engineering design considerations and involves many more considerations than just density.

If you have not done so, review the [Exploring Basic Mat Properties project](#) to understand the materials science behind basic material properties.

Explore density values. What do you notice? In

Composite materials and composites are often u

Review the link for Sp

Now, let's explore the d consider using it (think

What's the least dense

What patterns do you e differences in densities C and H and other ele

Select materials which might be good choices for various aerospace parts, based on density. See the chart and examples could be a satellite antenna or a quadcopter blade.

**Add/Edit Related Content**

Search [AccessEngineering](#) to identify related content

Density Table - Various Materials  
<https://accessengineeringlibrary.com/browse/marks-standard-handbook>

Matweb - Steels  
<http://www.matweb.com/search/QuickText.aspx?SearchText=steel>

**Related Content** [Edit Related Content](#)

[Density Table - Various Materials](#)

[Matweb - Steels](#)

[Aircraft Materials](#)

[Composite Materials](#)

[Spacecraft Structures](#)

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**Density (kg/m<sup>3</sup>)**

Density (kg/m<sup>3</sup>) (Linear / Log)

High

Low

+ Metal + Polymer + Ceramic + Composite + Advanced

- Add related materials to create context for your project
- Simply create a title and paste the link of the desired materials

# Save & Share

**DataVis** | ACCESS Engineering  
Material Properties

Props for Aerospace Structures [View/Edit Description](#)

Hide Page Navigation ▾

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[Home](#) [My Projects](#)

[Save As](#) [Share](#) [Export Page](#) [New](#)

Density Density and Specific Gravity Density, SG, E Density, SG, E, Frac. T TS, Flex S, YS T, YS C, R Hard Costs, Absolute and Relative

+

>

Access your projects

Save project

Export page to a PDF

Copy the text below to share your DataVis projects

**Props for Aerospace Structures**

Properties for Aerospace applications by Kathleen Kitto, Western Washington University

<https://accessengineeringlibrary.com/datavis/material-properties#/document/7d19969d-2a95-48b2-bc3e-d3bb3f471c10?page=1>

Share your completed projects with your colleagues, simply click the share button to generate a project link

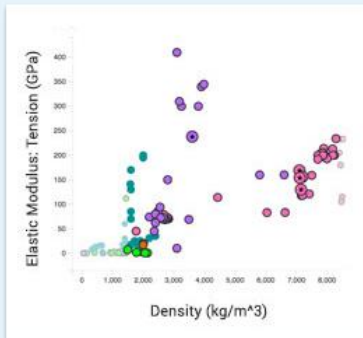
# Find a property value for a single material

DataVis  
Material Properties

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Compare properties across multiple materials



Find a property value for a single material

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[Open Project](#)

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[Open Project](#)

## Find a property value for a material

Concrete: Steel Reinforced

Clear

Density

Clear

2400

kg/m<sup>3</sup>

Source: Matbase, matbase.com

Change the units of your results

Results

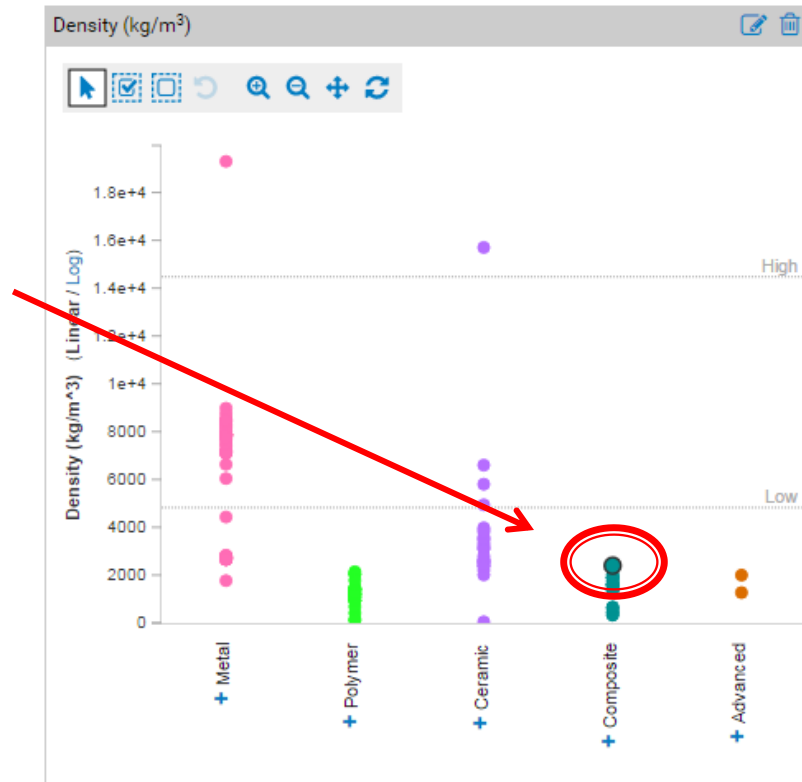
Compare Density for all materials

With your search results you can  
choose to generate a new project

# Generate a new project with your search results

The search results for Concrete Steel Reinforced is now highlighted in the new visualization

Concrete Steel Reinforced is also listed at the very top of the tabular data



Tabular Data							Export CSV
Select	Range	Star	Material	Classification	Density (kg/m³)		
<input checked="" type="checkbox"/>	In	☆	Concrete: Steel Reinforced	Composite	2400		
<input type="checkbox"/>	In	☆	Acetal Copolymer	Polymer	1420		
<input type="checkbox"/>	In	☆	Acrylonitrile Butadiene Styrene (ABS): Molded	Polymer	1060		
<input type="checkbox"/>	In	☆	Alloy Cast Iron Overview	Metal	7190		
<input type="checkbox"/>	In	☆	Alumina (Al2O3): 96%	Ceramic	3800		



# Sample DataVis Projects are available

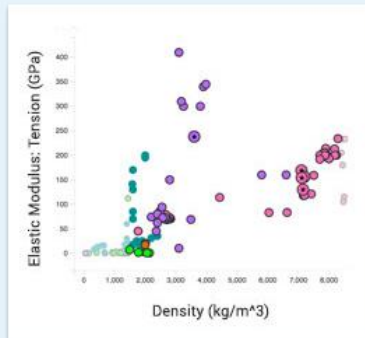
DataVis  
Material Properties

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## Available on the homepage



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[Open Project](#)

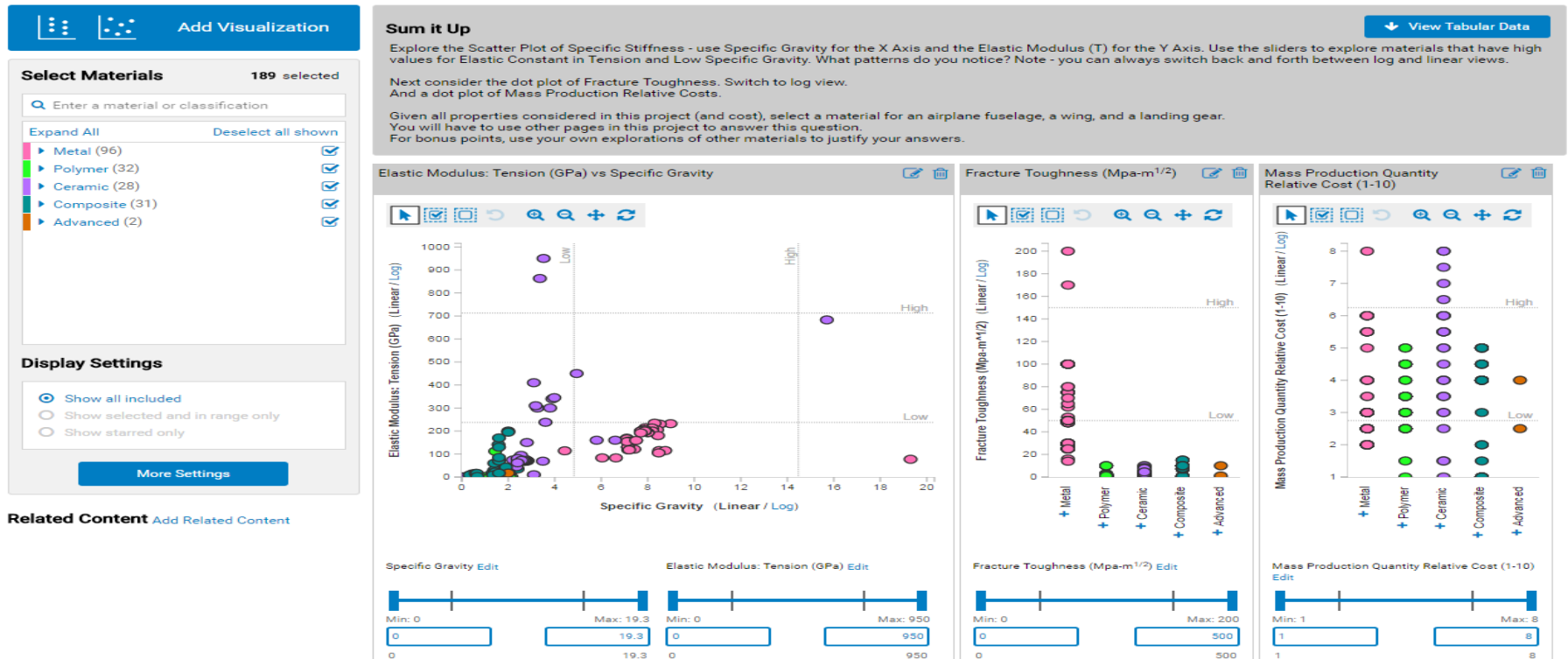
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[Open Project](#)

# Access customizable Sample DataVis Projects

- Sample DataVis projects are available for our instructor and student users
- Projects are assembled by leading faculty in the sciences and engineering
- Include these in your courses as active learning projects. You may use them “as is” or customize them to your personal needs.





[www.AccessEngineeringLibrary.com](http://www.AccessEngineeringLibrary.com)

[userservices@mhprofessional.com](mailto:userservices@mhprofessional.com)

# Questions?

