

Engineering Material Week 1 Period 1

Motivation	The motivation for learning this subject stems from the recognition that Material Science is a crucial foundation for creating physical products. Even minor material-related oversights can lead to catastrophic consequences, as evidenced by the sinking of the Titanic, attributed to engineers neglecting the property changes of materials at very low temperatures.
No Optimal Material	It's important to note that there is no single universally optimal material; what we have are materials that are suitable for specific tasks, and others that are not. The selection process involves finding an optimal balance between price and performance.
Key Elements	Key elements in the study of this subject are Structure, Property, Process, and Performance. Altering one aspect inevitably influences the others.
Types of Materials	There are four main types of materials: polymers, metals, ceramics, and composites. Predicting their properties and performance is possible based on their structure. For instance, ceramics, formed with ionic bonds, exhibit attraction between positive and negative charges, and breaking the ionic bond requires breaking the ceramics into pieces. Metals, characterized by metallic bonds and a sea of electrons, become electrical conductors. Many electrical conductors are also heat conductors due to the friction generated by the movement of electrons. Polymers, formed with covalent bonds, have relatively low boiling and melting points. Composites, which combine two types of materials, aim to enhance properties and performance.
Density and Strength	Generally, material density follows this order: composites < polymers < ceramics < metals. (Composites are designed to achieve the lowest weight, while the others are considered common sense.) Material strength similarly follows this order: polymers < ceramics < composites < metals. (Composites still can't surpass metals, and the others are considered common sense.) It's crucial to note that there is variability within each material category.

Citation

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