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Materials Science and Metallurgy 3

Materials Science and Metallurgy

Snippet from Wikipedia: ***Materials science***

> **Materials science** is an interdisciplinary field concerned with understanding the relationships between the structure of materials and their properties and using this knowledge to design materials for specific applications. The internal structure of a material—from atomic arrangements to microscopic features—strongly influences its mechanical, electrical, thermal, and optical behavior. In engineering practice, materials science and engineering are often described through the processing–structure–properties–performance paradigm, in which processing determines structure, structure determines properties, and properties ultimately control the performance of a material in service.
>
> The intellectual origins of materials science stem from the Age of Enlightenment, when researchers began to use analytical thinking from chemistry, physics, and engineering to understand ancient, phenomenological observations in metallurgy and mineralogy. Materials science still incorporates elements of physics, chemistry, and engineering. As such, the field was long considered by academic institutions as a sub-field of these related fields. Beginning in the 1940s, materials science began to be more widely recognized as a specific and distinct field of science and engineering, and major technical universities around the world created dedicated schools for its study.
>
> By studying how the history of a material (*processing*) influences its structure, properties, and performance, materials scientists have made many contributions to new technologies in biomaterials, metallurgy, and nanotechnology. Materials science is also used by forensic engineers and failure analysts to understand why and how critical components fail, which helps prevent dangerous and costly accidents in areas such as aviation.

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- Introduction to Materials Science
- Crystal Structures and Lattice Defects
- Phase Diagrams and Alloy Systems (Iron-Carbon, etc.)
- Heat Treatment (Quenching, Tempering, Annealing)
- Material Testing (Tensile, Compressive, Hardness, Impact)
- Types of Corrosion and Prevention Methods
- Composites and Advanced Materials

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