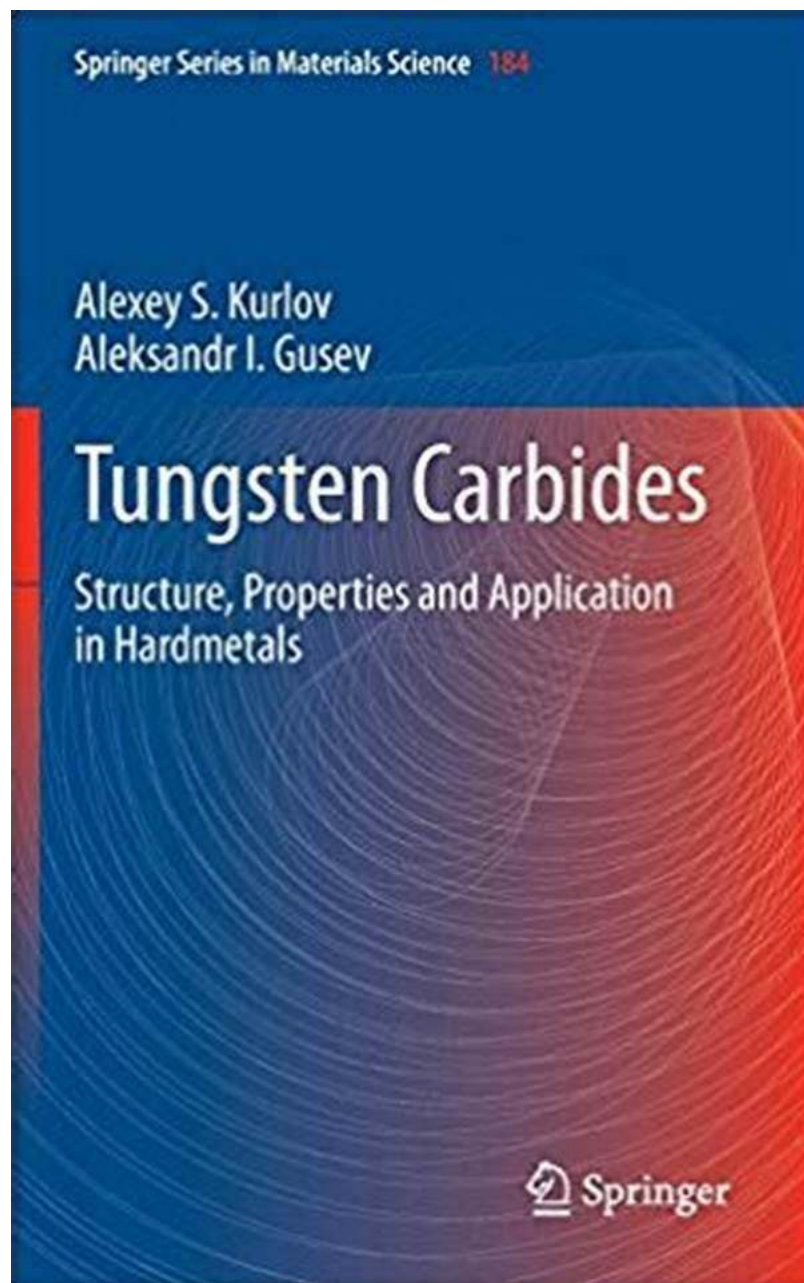


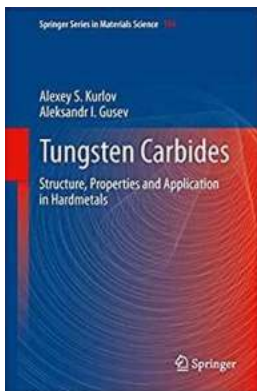
The Fascinating World of Hardmetals: Unveiling their Structure, Properties, and Applications



Hardmetals, also known as cemented carbides, are a versatile group of materials that find applications across various industries due to their exceptional hardness, wear resistance, and strength. In this article, we will dive into the world of hardmetals, exploring their intriguing structure, unique properties, and wide-ranging applications.

The Structure of Hardmetals

Hardmetals consist of two main components: a metal matrix and hard carbide particles. The metal matrix serves as a binder, holding the carbide particles together and providing toughness, while the carbide particles impart hardness and wear resistance to the material.



Tungsten Carbides: Structure, Properties and Application in Hardmetals (Springer Series in Materials Science Book 184)

by Alexey S. Kurlov (2013th Edition, Kindle Edition)

★★★★☆ 4.2 out of 5

Language : English
File size : 15244 KB
Text-to-Speech : Enabled
Screen Reader : Supported
Enhanced typesetting : Enabled
Print length : 497 pages



The most commonly used metal matrix in hardmetals is cobalt due to its excellent bonding capabilities with carbides. The carbide particles can be tungsten carbide (WC), titanium carbide (TiC), tantalum carbide (TaC), or a combination of these. These carbides are known for their exceptional hardness, often exceeding that of steel by several orders of magnitude.

The Properties of Hardmetals

One of the most remarkable properties of hardmetals is their hardness. Hardmetals usually have a hardness between 70 and 95 HRA (Rockwell A-scale), which makes them suitable for applications involving high levels of wear and abrasion. Their hardness also enables them to retain their shape and sharpness even under extreme conditions, such as high temperatures and heavy loads.

In addition to hardness, hardmetals possess excellent wear resistance due to the high hardness of the carbide particles. This property makes them ideal for cutting tools, metal forming dies, and mining tools, where they can withstand the severe conditions encountered during machining, deformation, and excavation processes.

Furthermore, hardmetals exhibit high compressive strength, allowing them to endure heavy loads without deforming or fracturing. Their high strength enables the construction of robust and durable components in industries ranging from aerospace to oil and gas.

Applications of Hardmetals

The exceptional properties of hardmetals make them invaluable in a wide range of applications across various industries:

1. Cutting Tools

Hardmetals are extensively used in the production of cutting tools such as drills, milling cutters, and turning inserts. Their hardness and wear resistance allow for prolonged tool life and increased productivity in metalworking, woodworking, and composite material machining.

2. Metal Forming Dies

In metal forming processes like forging, extrusion, and stamping, hardmetals are utilized as die materials due to their superior wear resistance and toughness. Hardmetal dies can withstand the repeated impact and high pressures involved in shaping metal components with precision.

3. Mining and Construction Tools

Hardmetals play a critical role in the mining and construction industries, where they are used for rock drilling, tunneling, and excavation. Their hardness and strength allow for efficient drilling and cutting through hard rocks and concrete, ensuring the durability and productivity of such tools.

4. Wear Parts and Tooling Inserts

In sectors like automotive, aerospace, and oil and gas, hardmetals find applications as wear parts and tooling inserts. They are utilized for their exceptional wear resistance, ensuring extended service life even under extreme operating conditions.

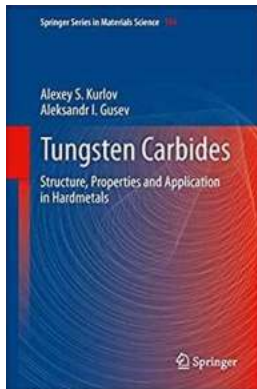
Hardmetals are fascinating materials that possess an exceptional combination of hardness, wear resistance, and strength. By understanding their structure, unique properties, and numerous applications, we can truly appreciate their significance across various industries. Whether it is cutting through tough materials, shaping metal components, or drilling into the earth, hardmetals continue to revolutionize the way we tackle challenges in everyday life.

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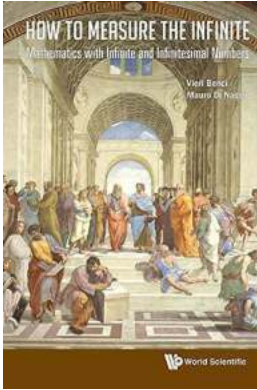
This book embraces the entire range of problems associated with phase equilibria in “tungsten – carbon” binary system and related ternary systems, nonstoichiometry, disorder and order in different tungsten carbides, electronic and crystal structure of these carbides.

The main application of tungsten carbides is constituent in hardmetals for cutting tools. In the last 20 years, the most active efforts were made in synthesis and application of nanocrystalline tungsten carbide for the production of nanostructured hardmetals. The present book describes in detail different methods for production of nanocrystalline tungsten carbide. The peculiarities of sintering of Co hardmetals from nanocrystalline powders having different particle sizes are discussed. Materials scientists using tungsten carbide to create novel superhard and tough materials will find this book particularly useful.



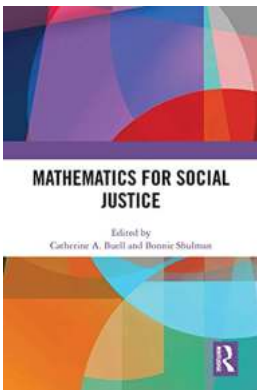
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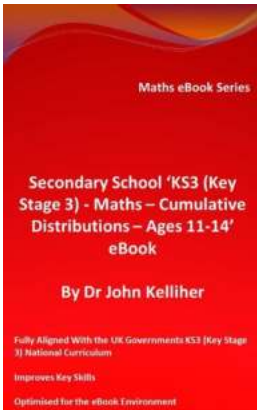
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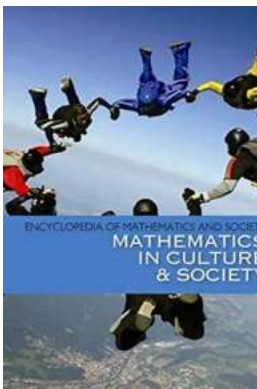
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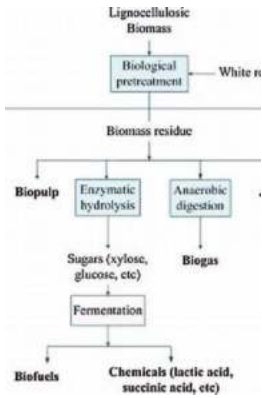
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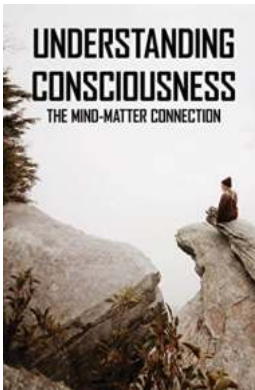
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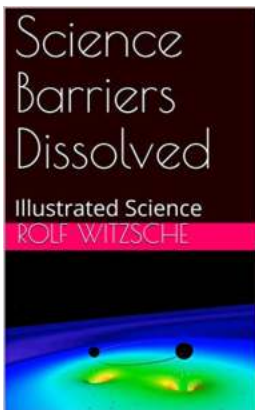
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