STUDY NOTES · BASIC CONCEPT

What is the use of tungsten powder? Why does it come so costly?

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What?

Tungsten powder is a highly versatile raw material derived from tungsten ore. Because tungsten has the highest melting point of any metal (3,422°C / 6,192°F), it cannot be easily melted and cast into shapes using standard smelting techniques. Instead, it is processed into a fine powder and then compressed and heated (a process called sintering) to manufacture various high-performance components.

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What is Tungsten Powder Used For?

Cemented Carbides & Cutting Tools (~50–60% of total use): Tungsten powder is mixed with carbon to create tungsten carbide. This ultra-hard material is used to make industrial drill bits, mining equipment, cutting inserts, and saws for machining steel and stone.

Defense and Military Applications: Due to its extreme density (similar to gold), tungsten powder is alloyed into heavy metals used for armor-piercing ammunition, artillery shells, missile parts, and heavy kinetic energy penetrators.

Electronics & Semiconductors: Used in microchips, heat sinks, X-ray targets, micro-electrical contacts, and filaments because it handles intense heat and electric currents without degrading or expanding significantly.

Aerospace & Heavy Industry: Formed into heavy alloys used for counterweights, balance weights in aircraft and performance vehicles, and radiation shielding (e.g., in medical CT/MRI machinery or nuclear facilities).

3D Printing (Additive Manufacturing): Fine-grade tungsten powder is increasingly used in specialized metal 3D printing for complex aerospace and medical components.

Why is Tungsten Powder So Expensive?

Tungsten is expensive due to a combination of mining/processing complexity, geopolitical supply bottlenecks, and surging global demand:

Difficult Extraction and Refining: Extracting pure tungsten from ores (like wolframite or scheelite) involves a complex, multi-stage chemical process rather than basic smelting. Converting it into uniform, high-purity micro-powders requires specialized equipment, energy-intensive chemical reduction, and stringent environmental controls.

China's Supply Monopoly: China controls roughly 80% of global mine production and processing capacity. Strict Chinese export quotas, tariffs, and environmental clampdowns on local mines severely restrict the global supply of tungsten powder.

High Strategic Demand: Global defense spending, ammunition replenishment, and expanding high-tech industries (like semiconductor manufacturing and electric vehicles) have driven demand to record highs.

Scarcity and Non-Recyclability: High-grade tungsten reserves are limited globally. Furthermore, once used in applications like fired ammunition, the metal is permanently lost and cannot be recycled.

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