FUNCTIONALLY GRADED TANTALUM/NIOBIUM CARBIDE

MATERIALS
Ceramic material with improved strength, durability, hardness, and fracture toughness for use in high temperature and/or corrosive applications.

TECHNOLOGY TYPE
Ceramics
Metallurgy
Material Science

STAGE OF DEVELOPMENT
- Early stage TaC prototype demonstrated for certain wear applications and manufacturing process.
- Novel nobium carbide ceramic testing in process.

IP PROTECTION
Nationalized PCT Issued in the United States
High-Toughness Zeta-Phase Carbides
US8685874B2
US Utility Patent Issued
Methods of Sintering Dense Zeta-Phase Tantalum Carbide
US9896384B2
Additional Patent Pending in the United States and China

LEARN MORE
Reference Numbers: U-4451, U-5794, U-5881

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TECHNOLOGY SUMMARY
Hard materials resist wear, but are prone to fracture. Tough materials resist fracture, but are susceptible to wear. Ideally, a material should possess a combination of high hardness and high fracture toughness, but designing such a material has proven difficult. A novel tantalum or niobium carbide (TaC or NbC) results in a composite with superior strength and fracture toughness. The material consists of two-phases, a hard carbide on the outside and a tough carbide in the interior. The carbide substrate can be produced using conventional powder processing methods to fabricate complex shapes and surface-treatment. The proposed material outperforms tungsten carbide in applications that require hardness, fracture toughness, and corrosion resistance.

FEATURES AND BENEFITS
• Provides durable material that is suitable for high-temperature and high-pressure applications.
• Increases strength, hardness, and fracture toughness by up to three times that of Tungsten Carbide
• Able to manufacture components from a single piece of material.

RECENT PUBLICATIONS

INVENTOR PROFILE
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