Licensable Technologies

Ultra-Strong Diamond Silicon Carbide

Applications:

- Power tools
- Mining
- Road construction
- Wire drawing
- Oil drilling
- Mechanical instruments

Benefits:

- Impact tools with significantly longer functional lives.
- Faster cutting of harder materials.
- Reduced drilling time and expense.
- Longer wear and less maintenance for mechanical parts in other applications.

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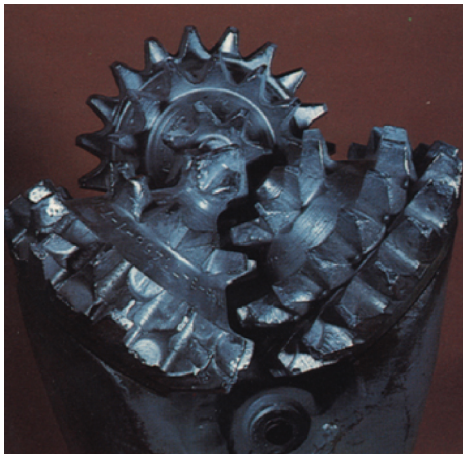
Summary:

Diamond is the hardest naturally occurring substance. Not surprisingly, diamond composites are used in many high-performance cutting tools and drill bits. There are some high-impact and high-stress environments, however, where even conventional diamond composites are unable to withstand the pressure. For these applications, the mechanical properties of interest are hardness, toughness, compressive strength, transverse rupture strength, and wear resistance. For example, some rocks drilled by the oil industry are too hard for conventional drill bits. For this reason tungsten carbide is the current material of choice in the drilling industry. Tungsten carbide is the ideal material for many applications due to its high hardness, high compressive strength, resistance to high temperatures, dramatic wear-resistance and excellent toughness.



The teeth of the roller-cone drilling bit are equipped with abrasive inserts made of our diamond nanocomposites, which stand up to the intense friction, impact, and heat of downhole drilling environments in the oil and natural-gas industry.

Los Alamos National Laboratory (LANL) has developed methods of preparing ultra-strong diamond silicon carbide that can withstand about 20% more pressure than can tungsten carbide. These ultra-strong diamond silicon carbide composites may form the next generation of industrial drill bits, cutters, and grinders.

One of the highest single costs in oil drilling is drill-bit wear and breakage. LANL's ultra-strong diamond silicon carbide composites should yield impact tools with significantly longer functional lives. Furthermore, harder materials could be cut faster, which would reduce drilling time and expense. Mechanical parts in other applications would wear longer and require less maintenance.

In the United States, approximately $200–$300 million are spent annually on raw tungsten carbide, and about 80% of that raw tungsten carbide is used in drill bits and other high-pressure tools. The total world demand for raw tungsten carbide fluctuates, but in 2002 approximately $1.5 billion was spent for raw tungsten. The total world market for tungsten carbide finished tools exceeds $10 billion.

A company formed around ultra-strong diamond silicon carbide could exist almost anywhere in the production chain. Ultra-strong diamond silicon carbide could be manufactured under licensing arrangements with current raw material suppliers, sold directly as a raw material, or incorporated into new tools and sold by the company in the form of a finished product.

Development Stage:

The LANL process yields composite material with high thermal and mechanical stability and high temperatures and high impact conditions.

Intellectual Property Status:

Patents are pending.

Licensing Status:

Exclusive and non-exclusive licenses are available.

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