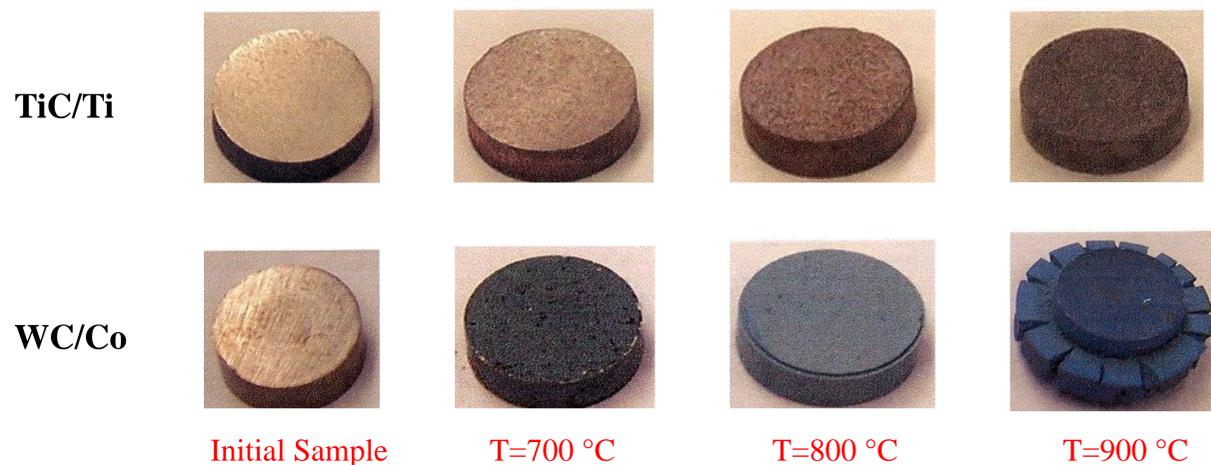


Method for the Production of Diamond-Hardfaced Titanium Carbide/Titanium Bits for Geothermal Drilling

Highlights of Phase I research

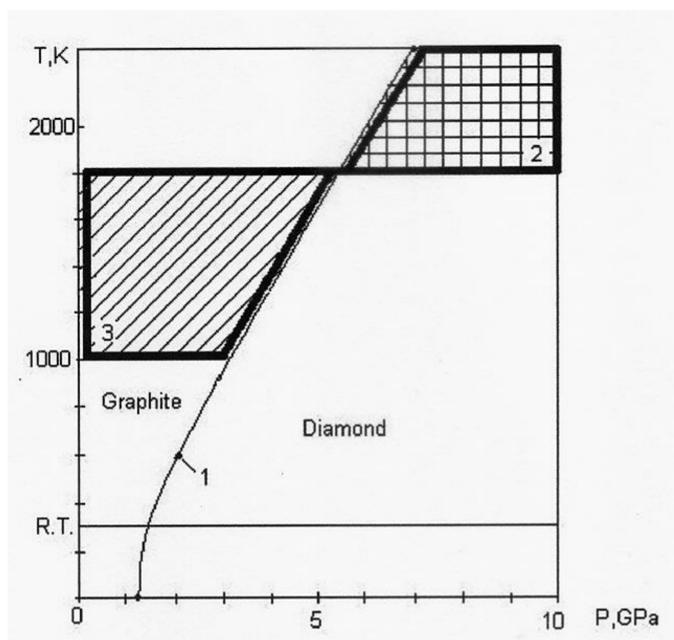
- A new class of **diamond-hardfaced titanium carbide/titanium (D-TiC/Ti) composites** is being developed, which offer **performance and processing** advantages over that of conventional **diamond-hardfaced tungsten carbide/cobalt (D-WC/Co) composites**.
- D-TiC/Ti composites display **superior oxidation resistance**, relative to that of D-WC/Co composites, without **sacrificing wear resistance**, thus making them attractive candidates for **rock-drill bits** (roller cone and drag bits) used in drilling of geothermal wells, and for **submersible-pump bearings** used in production of such wells.
- A major advantage for the superhard materials industry is the **significantly reduced pressure-temperature requirements** to produce D-TiC/Ti composites, so that **large area/volume superhard wear-resistant components or parts** can be produced, **for the first time**, in a cost-effective manner.

Oxidation Behavior of TiC/Ti Relative to WC/Co

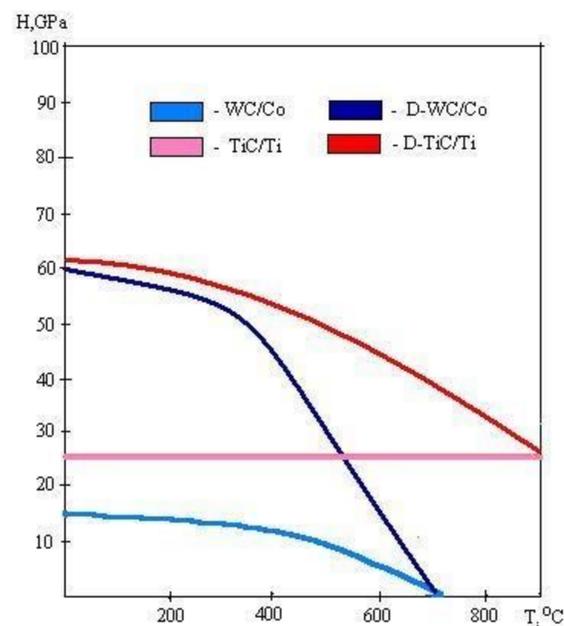


Oxidation resistance of TiC/Ti cermet is remarkably and incomparably higher than oxidation resistance of WC/Co cermets. The WC/Co cermets oxidize in air in 500°C - 900°C temperature range. Mass of samples increases, color changes, hardness and strength deteriorate. Samples of TiC/Ti cermets do not change size and mass at T=900°C, t=15min. holding in air. Minor surface color changes are observed, hardness and strength are unchanged or increase slightly.

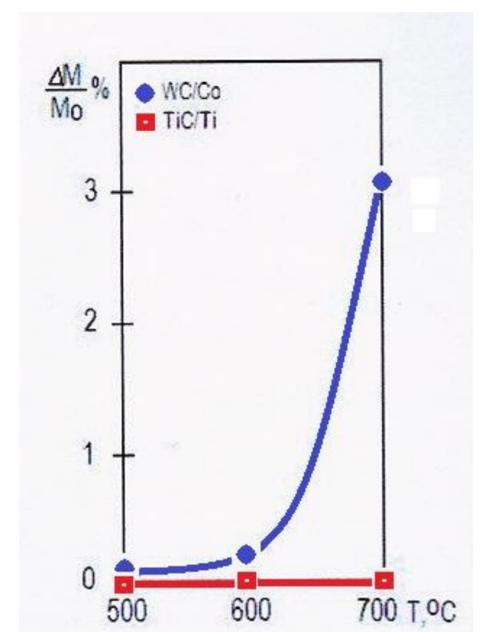
Properties and Performance of Hard and Superhard Composites



Pressure/Temperature (P/T) regions for producing: (2) D-TiC/Ti composites, and (3) D-WC/Co composites, showing much reduced P/T requirements for D-TiC/Ti composites. Regions (2) and (3) are separated by curve (1) of equal thermodynamic potentials for graphite and diamond.



Dependence of hardness on temperature for TiC/Ti and WC/Co composites, with and without diamond hardfacings.



Oxidation behavior of TiC/Ti and WC/Co composites, showing superior oxidation resistance of TiC/Ti at temperatures >500°C.

Contact information



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