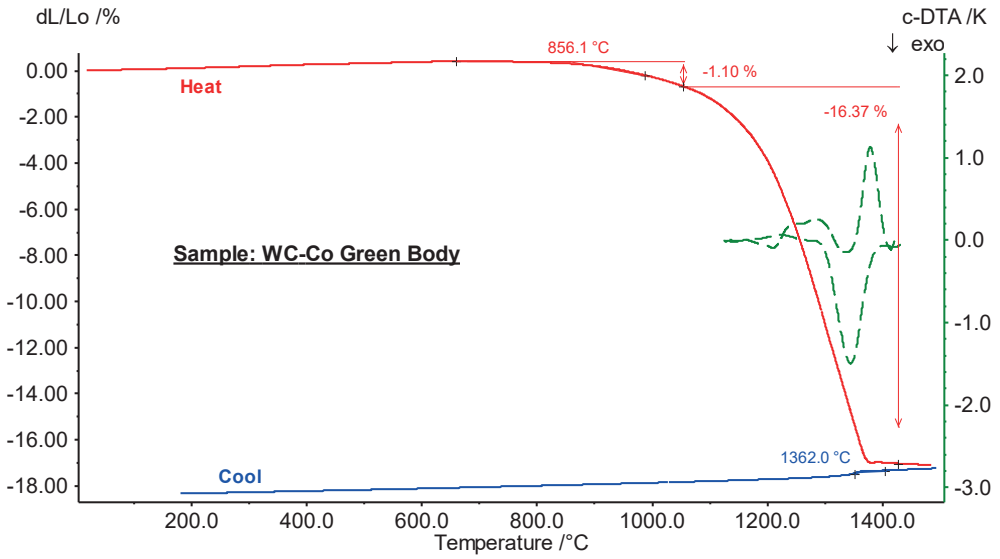
APPLICATION**SHEET**

Ceramics · Metal Industry
DIL 402

Tungsten Carbide

Introduction

Tungsten carbide, WC or W_2C, is a chemical compound containing tungsten and carbon, similar to titanium carbide. Its extreme hardness makes it useful in the manufacture of cutting tools, abrasives and bearings, as a cheaper alternative to diamond. Tungsten carbide is also used as a scratch-resistant material for jewelry including watch bands and wedding rings. Carbide cutting surfaces are often useful when machining tough materials, such as carbon steel or stainless steel, as well as in situations where other tools would wear away, such as high-quantity production runs. Sometimes, carbide will leave a better finish on the part, and allow for faster machining. Carbide tools can also withstand higher temperatures than standard high speed steel tools. Generally, tungsten carbide parts are sintered from the powder at elevated temperatures. To reduce the sintering temperatures cobalt is generally added as a sintering aid.



Test Conditions

Temperature range:	RT ... 1500°C
Heating/cooling rates:	10 K/min
Atmosphere:	Helium
Sample length:	23.75 mm
Calibration:	with alumina

Test Results

Presented in the plot are the measurement results (thermal expansion) for a tungsten carbide green body up to 1500°C.

As can be seen, sintering (starting at 856°C) occurred in two steps (1.10 and 16.37%). Slightly above 1350°C, sintering stopped rapidly. This effect is caused by melting of an eutectic formed by tungsten, carbon and the sintering aid (cobalt). The melting process is indicated by an endothermal peak in the c-*DTA*® analysis. Durin g cooling, the eutectic solidifies at 1362°C (step in the thermal expansion, exothermal peak in the corresponding c-*DTA*® curve). The example shows that sintering of such hard metals can easily be analyzed with a pushrod dilatometer including c-*DTA*® analysis

NGB · Application Sheet 128 · E · 0821 · Technical specifications are subject to change.

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