TECHNICAL DATA SHEET

umicore
Cobalt & Specialty Materials

STEP®40

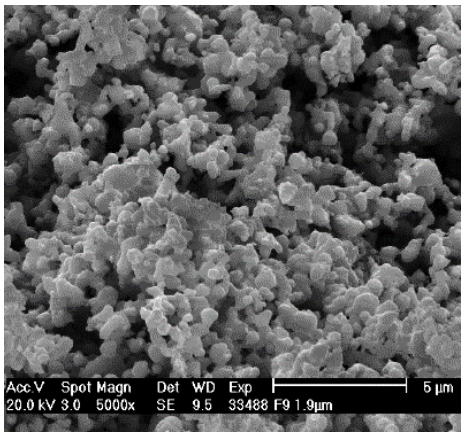
Base Pre-Alloyed Powder • Self-Brazing

TYPICAL PHYSICAL AND CHEMICAL DATA

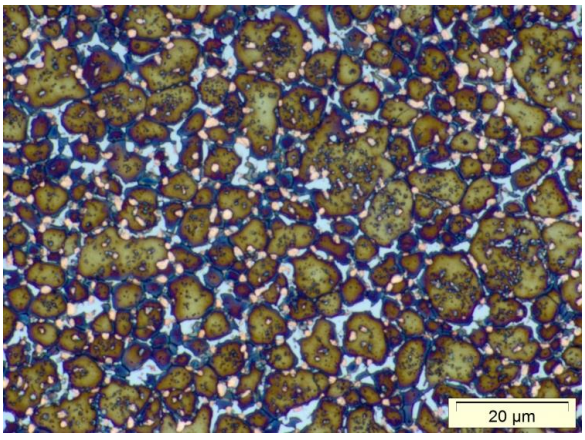
STEP®40 powder	
Fisher grain size *(µm)*	1.75
Theoretical density *(g/cm³)*	7.80
Scott density *(g/cm³)*	1.0
Tap density *(g/cm³)*	2.2
Oxygen content *(wt %)*	< 1.0
d10 - d50 - d90 *(µm)*	2.0 - 4.0 - 7.6

SINTERING CONDITIONS *in batch furnace*	
Minimum sintering temperature	900°C
Recommended sintering temperature	950°C
Cold Pressure	200 MPa
Holding time	60 min
Atmosphere	100% H_2

SEM PICTURE



ETCHED MICROSTRUCTURE



Copper phase in red
Hard phase in blue
Iron phase in brown

OXIDATION RESISTANCE

Conditions : 35°C and 80% RH during 48h => the powder is stable (mass increase below 0.2%)
After sintering under hydrogen, the oxygen content in the part is below 0.3 wt %

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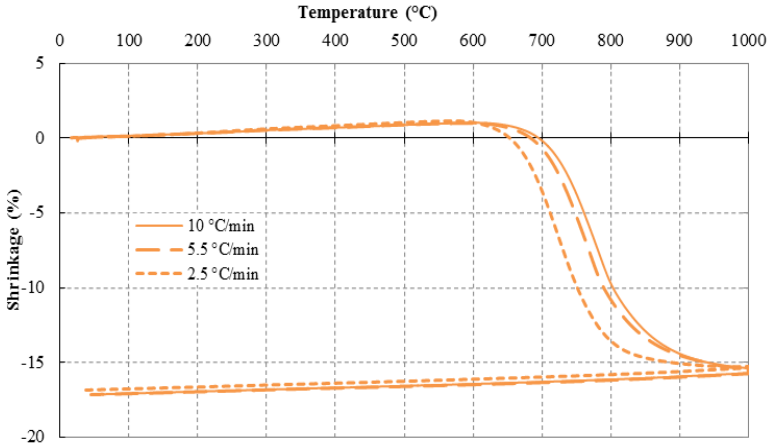
DILATOMETRIC CURVE with different heating rates



Specimens cold-pressed
under 200 MPa

MECHANICAL PROPERTIES

> Hardness (HV10) according to various sintering temperatures and effects of additives
Sintering conditions : Cold pressure = 200 MPa ; Holding time = 1h

Hardness (HV10)	900 °C	950 °C	1000 °C
Pure STEP®40	265	275	285
+ 5 % Br 85/15 -450 MESH	245	-	-
+ 10 % Br 85/15 -450 MESH	240	-	-
+ 10 % WC 3.0 µm	Low densification	-	290
+ 5 % Ni	-	305	-
+ 5 % Fe	-	270	-
+ 10 % Fe	-	275	-
+ 5 % FeP10	-	275	-
+ 10 % FeP10	-	285	-

> Impact resistance at 950°C : 10 J/cm²

> Tensile properties at 950°C

	Elastic limit	Total elongation
Cobalt	650 MPa	1.0%
STEP®40	680 MPa	0.5%

Note : STEP®40 has a similar plastic deformation as Cobalite®HDR or MX1480

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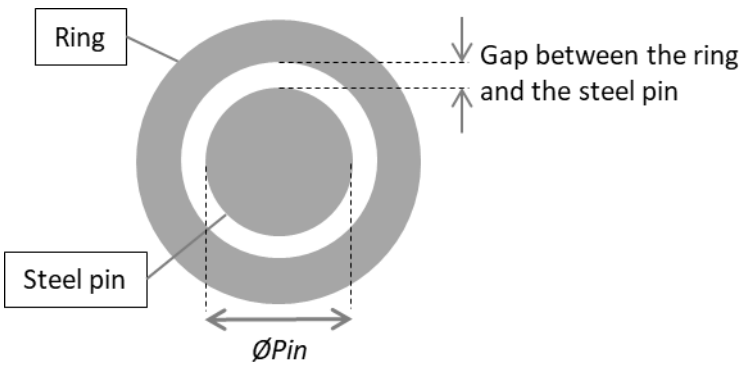
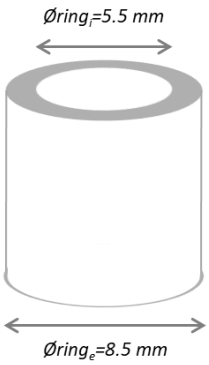
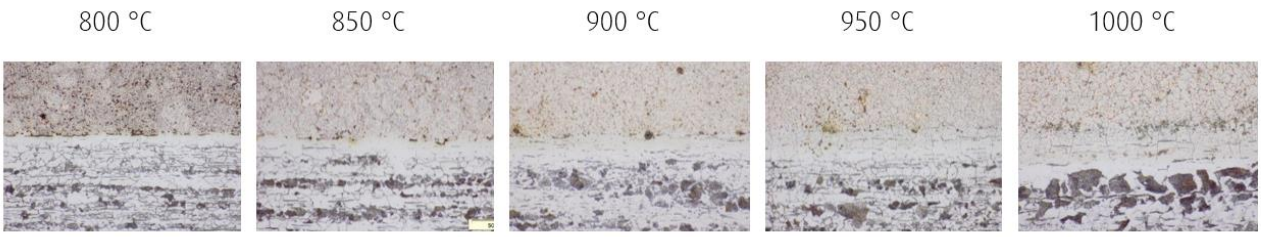
SELF BRAZING CHARACTERIZATION

Initial state

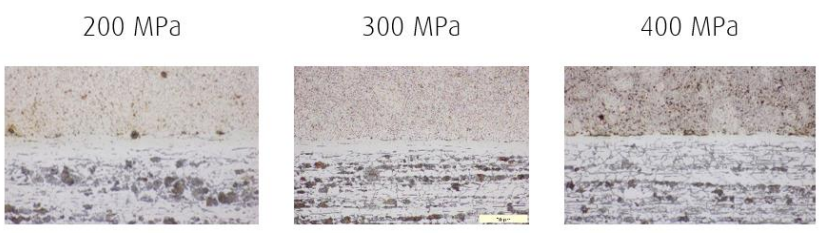




Specimens cold-pressed at 200 MPa



Specimens sintered at 900°C



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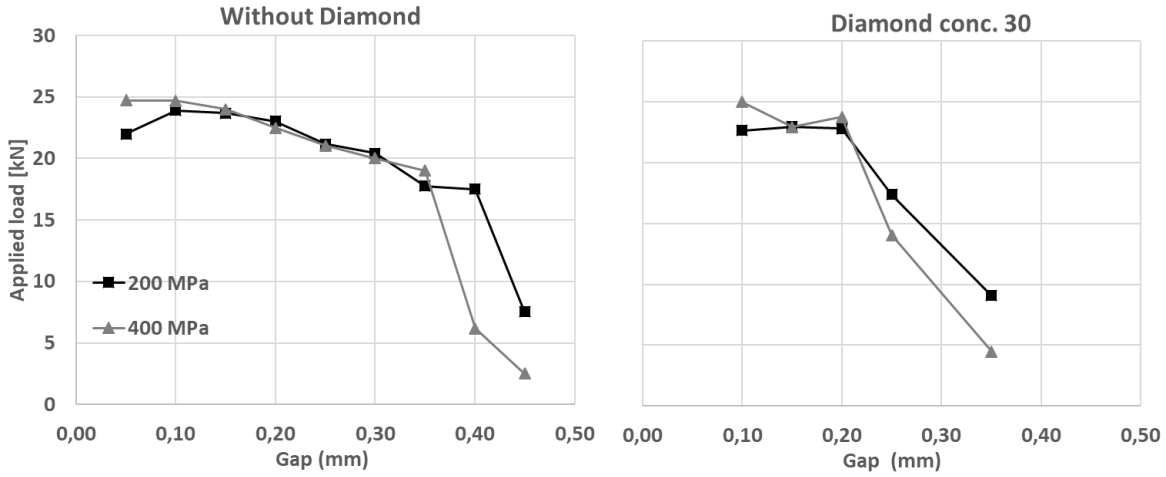
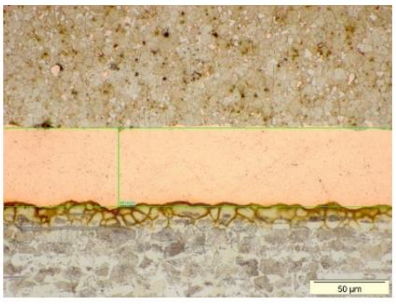
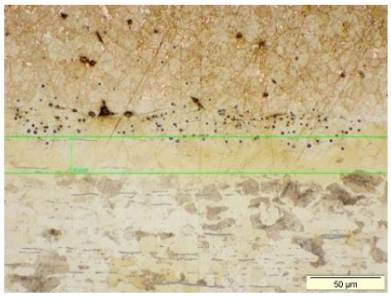
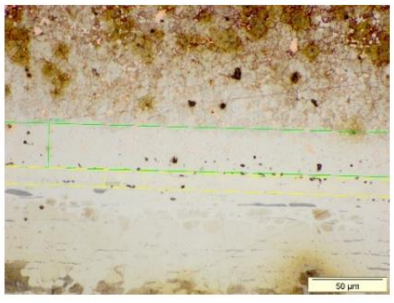
Uncoupling and vice test



Coating effect

Copper	Uncoated Steel	Nickel
		
Limited diffusion	Good diffusion	Good diffusion

Self-brazing behavior is more easily obtained with Nickel coating or uncoated steel

GENERAL INFORMATION

Umicore Cobalt and Specialty Materials produces and markets a variety of Cobalt-, Nickel-, or Tungsten-based chemicals and powders for a broad range of industrial applications including hard metals, diamond tools, pigments, catalysis, plating, paint, tires and animal feed.

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