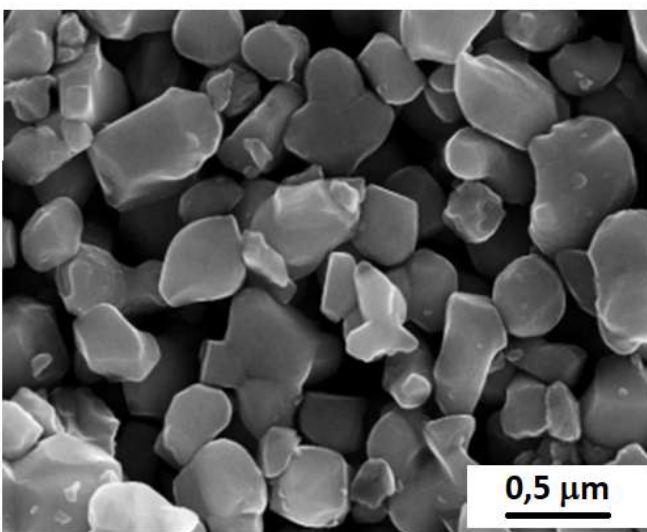
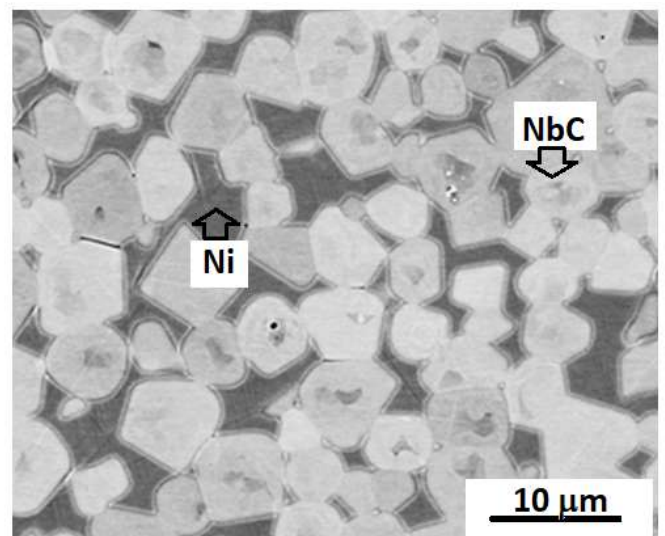


E3METAIS – SOLUÇÕES PARA ALTO DESEMPENHO

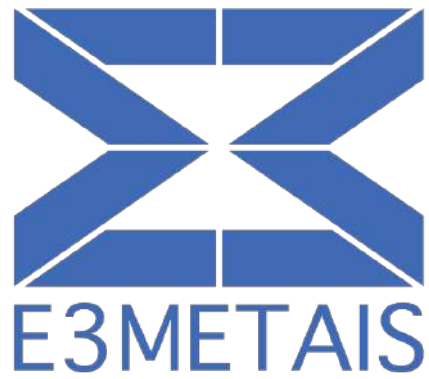
High Performance solutions



Niobium Carbide Submicron Powder



Niobium Carbide(sintered) – Nickel Bonded Material Microstructure



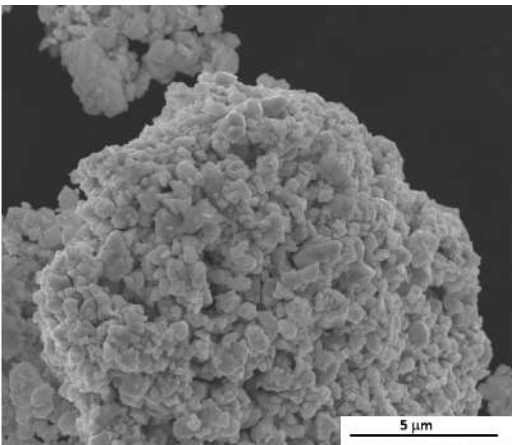
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Introduction

E3 METAIS, a company specialized in solutions for high performance tools, through "design of materials with high wear resistance", has focused its efforts on the development of new technologies in hard metal. Currently developing the state of the art of the system NbC-Ni (Niobium Carbide - Nickel), alternative to the traditional specifications of WC-Co (Tungsten Carbide - Cobalt) and FeTiC (Iron - Titanium Carbide). The detailed alloy design of the tool material and specialized technical assistance, result in the improvement of properties of the component, and consequently the increase of the equipment productivities and cost reduction.

However, E3 Metais expanded its product line to tungsten carbide based materials. This complements the possibility to cover the main application for wear resistance materials. E3 Metais represents the company Ecometal headquartered in the United States of America, which has a wide range of products in this segment.



Spray Dried Granules



Spray Drier Equipment

Location: Technological Park of São José dos Campos



Incubated at the Technological Park of São José dos Campos, which promotes science, technology, innovation and entrepreneurship, aiming at the competitive and healthy development of linked institutions. An environment that encourages cooperation between companies and research institutions to carry out research, development and innovation projects. A meeting point for governments, universities, companies and society.



Products:

Currently supplying Guide Rolls produced in the NbC-Ni system for the Long Products Mills, **E3Metals** has the ability to design solutions for high performance forming and cutting tools based on NbC.

The success of this development is related to the operational cost reductions of the equipment, due the benefit brought by the high wear resistance material of the components.

Products	Application	Hardness (HRA)	Fracture Toughness (MPa·√m)	TRS (MPa)
Guide Rolls	For long product mills	75/85	$K_{IC} > 15$	>1,500
Forming Tools	Forming die, drawing dies, punctions	85/91	$K_{IC} > 9$	> 1,500
Cutting Tools blank	Cermet for special application	> 90	$K_{IC} > 8$	> 1,000

* Shapes and dimension under evaluation

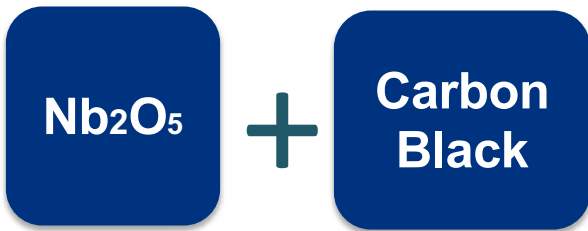
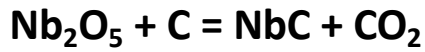


Products	Application	Purity	FSSS# (μm)
NbC Powder	For welding	>98%	1-2

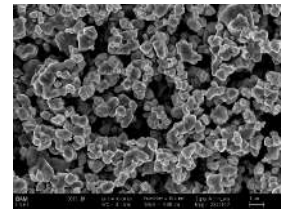


Process Sintered NbC-Ni Rolls

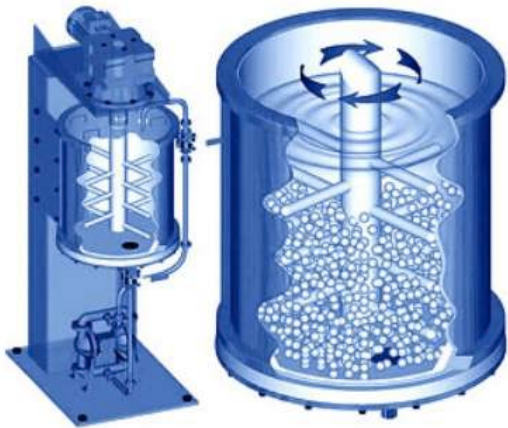
NbC Synthesis



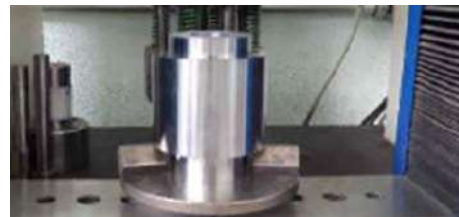
Powder (NbC)



Milling Process NbC + Ni + Additives



Green Compaction



Sintering



Guide Rolls



NbC has comparable properties with WC

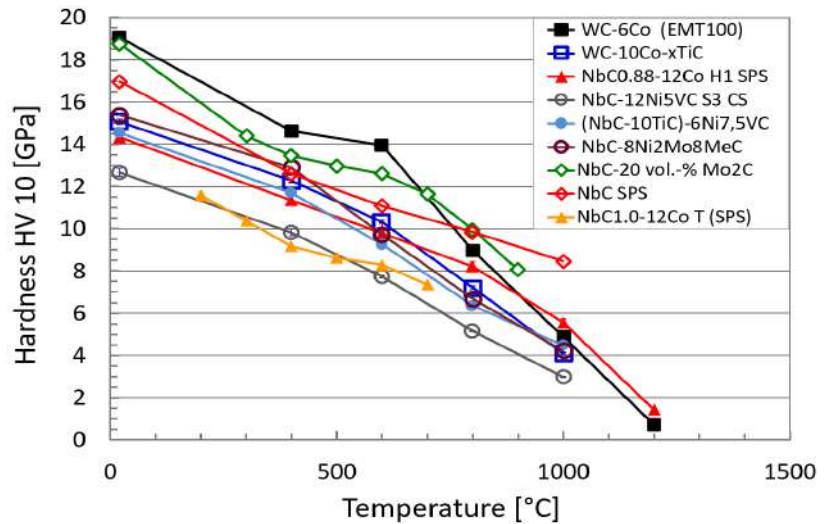
Property	WC	NbC
Density (g/cm ³)	16.63	7.70
Melting point (°C)	2,870	3,520
Microhardness (HV _{0.2} GPa)	24-28	17-22
Toughness K _{IC} (MPa·√m)	6.0-8.0	7.0-8.5
Thermal conductivity (W/m·k)	84	14
Specific heat (J/g·K)	0.203	0.351
Bulk modulus (GPa)	390-410	300-315
Elastic modulus (GPa)	700-730	380-480

- Half density of WC hardmetals, allows that components of NbC, being used under inertia, as finishing blocks guide rolls;
- High hot hardness of NbC of absence of the volatility of Nb₂O₅ guarantees the wear resistance of the NbC tools;
- Similar toughness than WC indicates that NbC can be an alternative material for hardmetal application reducing the dominance of China.

NbC-Ni: Mechanical Properties:

Hot Hardness

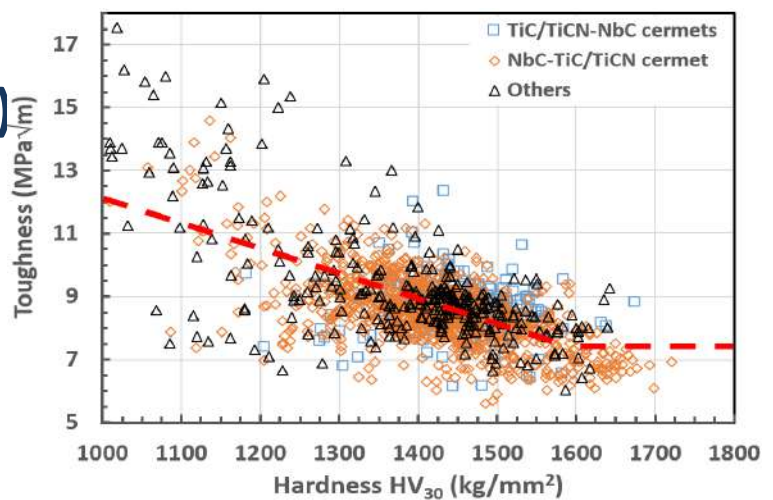
Similar or superior hot hardnesses than WC-Co materials are an indication for high temperature application for tools.



WOYDT et al.(Metal Powder Repo, Vol. 74(2), March/April 2019

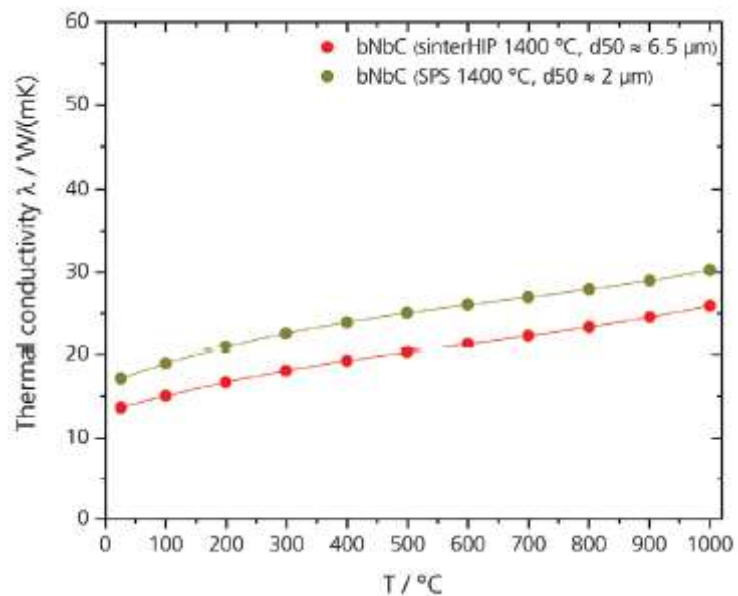
Fracture Toughness (K_{IC})

Mechanical Properties can be tailored according to the component application.



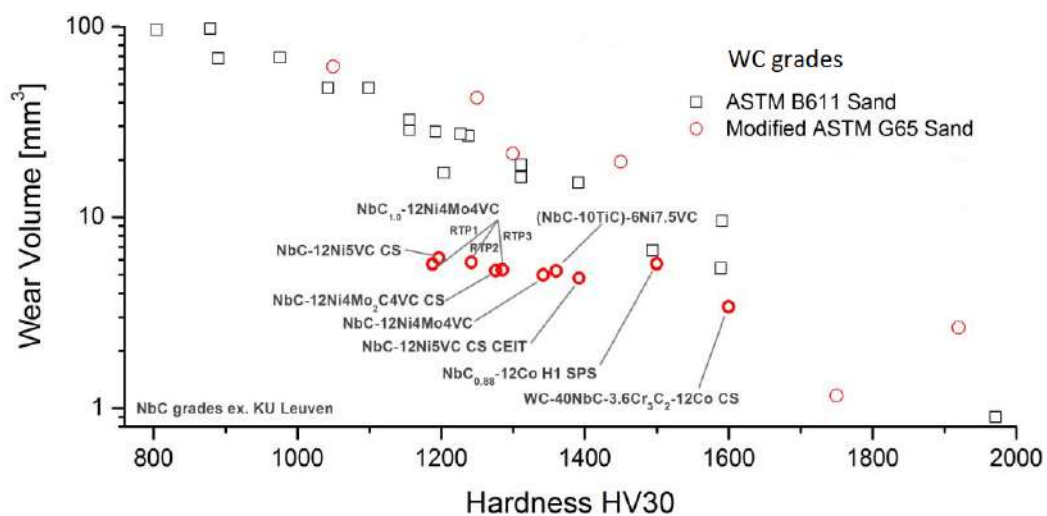
NbC-Ni: Thermal Properties

NbC-Ni –Thermal
Difusivity and
Conductivity increase
with the temperature



WOYDT et al. (Metal Powder Report, Vol. 74(2), March/April 2019)

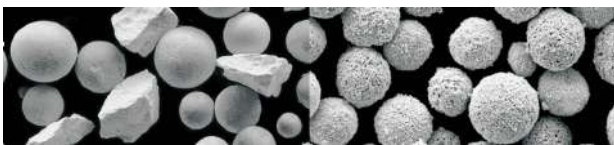
NbC-Ni and WC-Co wear resistance properties



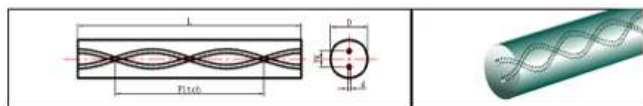
WOYDT et al. (Metal Powder Report, Vol. 74(2), March/April 2019)

Tungsten Carbide Products

Lines	Products
Hardfacing Thermal Spray Powder Plasma Transferred Arc (PTA) Powder	WC-Co; WC-Cr-Ni; WC-Ni; NiCr-Cr ₃ C ₂ series e other series
Mining Tools	Mining tools for various applications (diameter, cutting condition, fixing method, button type)
Metalworking Applications	Many types of carbide rods, precision ground rod, unground rod: with and without chamfers; with 2 (30 and 40 degree) or 3 (30 degree) helical hole , 1 straight hole centered , 2 straight hole standard BC, high precision modular shank, and others.
Road Tools	Cup and column form button; HUB, HUZ, and HUS series
Heavy Alloy Products	Main products: Tungsten heavy alloy; tungsten copper alloy; pure tungsten; pure molybdenum



Hardfacing



Metalworking Applications



Mining Tools



Roads Tools



Heavy Alloy Products



ECOMETAL
Innovative Industrial Supplier

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