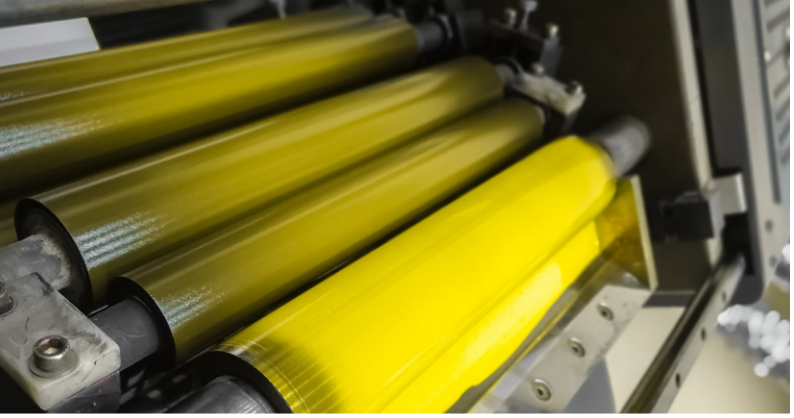



Amperit 678 & 685

Ultra-sustainable chromium carbides for challenging applications

Chromium Carbide (Cr_3C_2) powders are used to create dense coatings applied via High Velocity Oxygen Fuel (HVOF) and High Velocity Air Fuel (HVAF) spray methods. These powders consist of hard Cr_3C_2 particles in a NiCr or MCrAlY matrix.

In recent years, the use of certain elements, particularly cobalt (Co) and nickel (Ni), has raised concerns due to their potential harmful effects on the environment and human health. Additionally, reducing carbon footprints across the value chain has become a key priority for many companies addressing global warming and environmental challenges.

To tackle these issues, Höganäs developed atomized chromium carbides, **Amperit 678** and **Amperit 685**. These alloys' composition and production route were designed using Höganäs' Integrated Computational Materials Engineering (ICME) approach to optimize hardness, wear resistance, and corrosion resistance.

Amperit 678 is a sustainable atomized chromium carbide with a NiCr matrix designed for thermal spraying. The coating properties of **Amperit 678**, including hardness and mechanical properties, are comparable to those of agglomerated & sintered (A&S) chromium carbides. Moreover, **Amperit 678** offers superior corrosion resistance and is manufactured with a lower carbon footprint, both in terms of raw materials and energy usage.

This innovative product is an excellent candidate for coating components in power plant applications, such as boiler tubes.

Main Product Features:

- Good sprayability and consistent coating properties in a wide process window
- Dense coating with strong mechanical properties
- Hardness level of ~900–1000 HV
- Homogeneous microstructure
- High corrosion resistance in Neutral Salt Spray (NSS)

Amperit 685 is also an atomized chromium carbide, but it features an FeCr matrix. This nickel-free matrix makes **Amperit 685** the most sustainable chromium carbide to date. Its coating properties are mostly comparable to those of A&S chromium carbides while offering superior wear resistance.

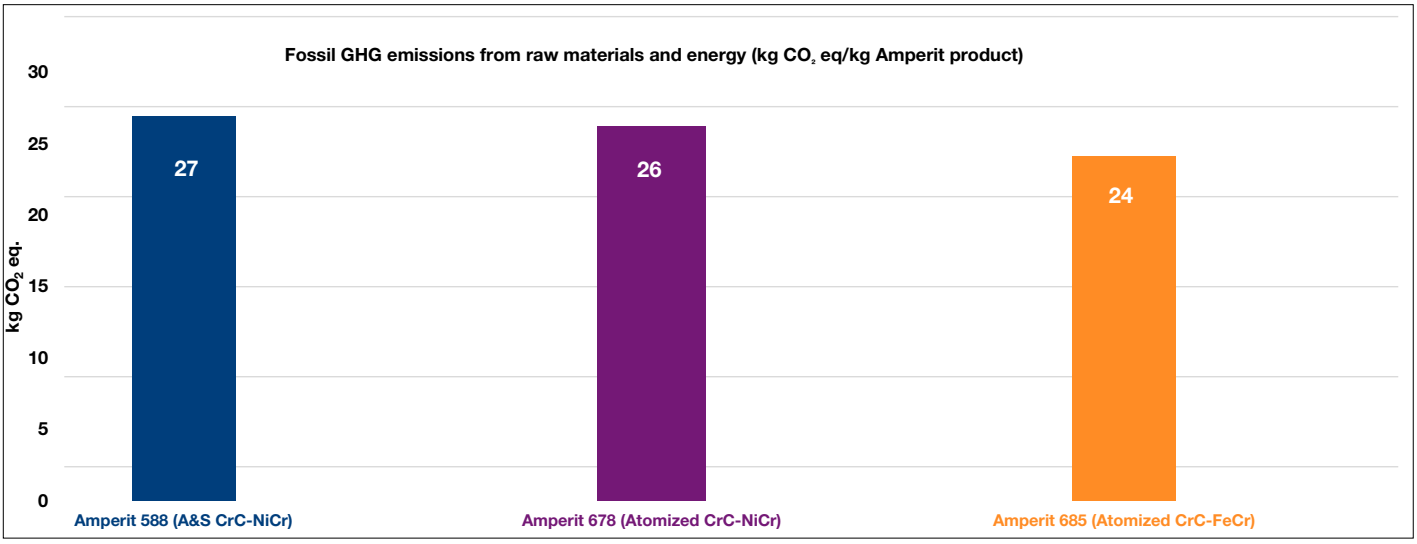
Furthermore, **Amperit 685** is manufactured with a lower carbon footprint, considering both raw materials and energy consumption. This product meets the highest sustainability standards and is ideal for applications with the most stringent sustainability requirements, such as blades and rollers in the food industry.

The productivity of HVOF spraying with atomized **Amperit 678** and is higher compared to A&S chromium carbides when using liquid-fueled systems, while the deposition efficiency is higher with gas-fueled systems compared to A&S chromium carbides.

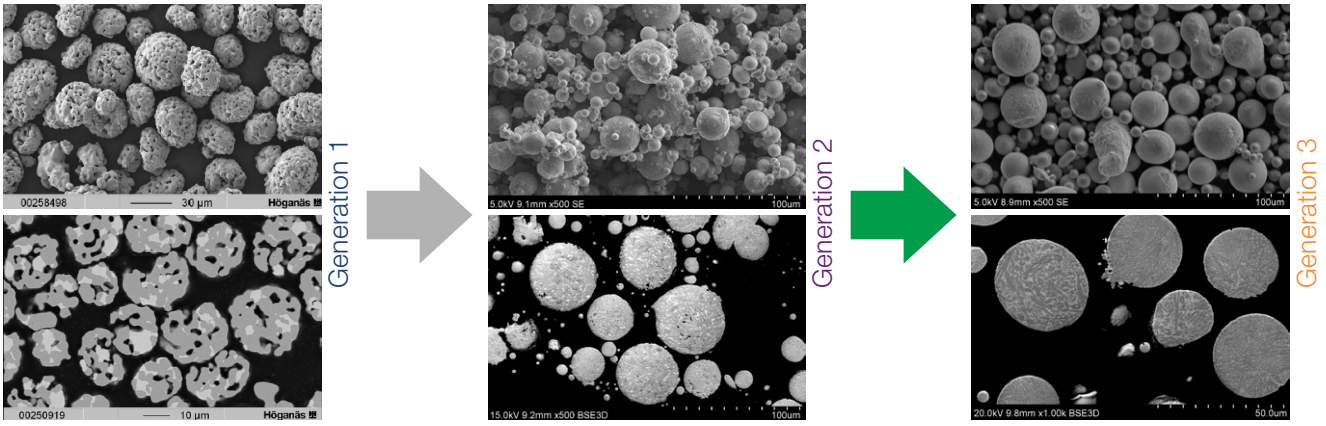
Main Product Features:

- Good sprayability and consistent coating properties in a wide process window
- Dense coating with strong mechanical properties
- Hardness level of ~900–1000 HV
- Homogeneous microstructure
- High corrosion resistance in Neutral Salt Spray (NSS)

Reduced Carbon Footprint for Atomized Chromium Carbides



The Path to the Most Sustainable Product



A&S Cr_3C_2-NiCr Amperit 588

- Contains Ni
- Many manufacturing steps

Atomized CrC-NiCr Amperit 678

- Contains Ni
- Less manufacturing steps
- Lower CO_2 footprint during manufacturing

Atomized CrC-FeCr Amperit 685

- Contains no Ni
- Less manufacturing steps
- Lowest CO_2 footprint during manufacturing
- Meets the highest sustainability standards

Typical Chemical Composition (wt%) of Amperit 678					
Cr	C	Mn	Ni	Fe	Si
Bal.	8.0	0.5	22.0	1.0	1.0

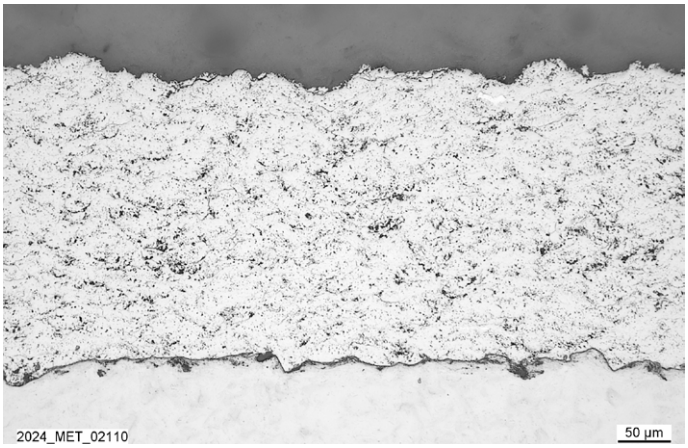
Amperit 678 Coating properties

Process

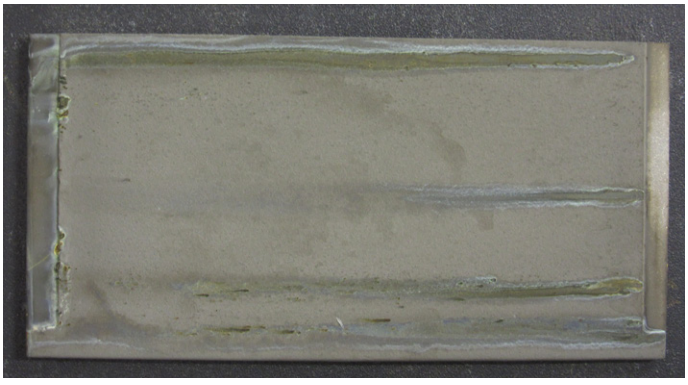
- Recommended for HVOF spraying
- Deposition efficiency ≈ 40%/liquid-fueled (LF)
- Deposition efficiency ≈ 60%/gas-fueled (GF)
- Higher productivity achievable compared to A&S Cr_3C_2 for LF & GF

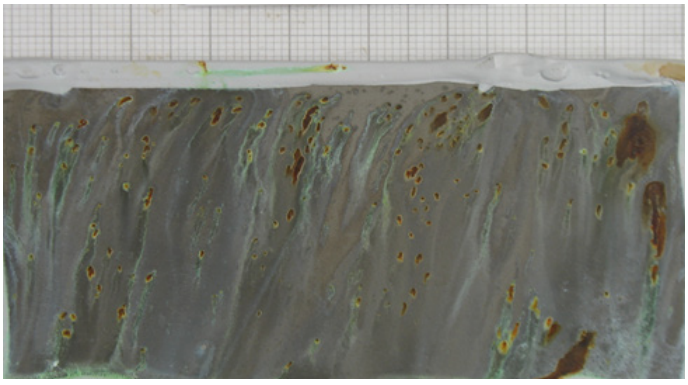
Coating Properties (LF & GF)

- NSS Corrosion Resistance > 1008 h
- Coating Hardness ≈ 1100 HV0.3
- Similar wear-resistant compared to A&S Cr_3C_2
- As-sprayed Roughness Ra = 5–7 µm
- E-Modulus ≈ 130–160 GPa
- Abrasion ASTM G65: B = 7–9 mm^3/2000R



Microstructure of Amperit 678 coating


Corrosion sample Amperit 678 after 1008 hours in NSS test


Corrosion sample Amperit 588 after 1008 hours in NSS test

Typical Chemical Composition (wt%) of Amperit 685							
Cr	C	Fe	Mo	Nb	Si	W	B
Bal.	5.0	16.0	2.0	0.5	1.0	0.7	0.7

Amperit 685 Coating properties

Process

- Recommended for HVOF spraying
- Deposition efficiency ≈ 40%/liquid-fueled (LF)
- Deposition efficiency ≈ 60%/gas-fueled (GF)
- Higher productivity achievable compared to A&S Cr_3C_2 for LF & GF

Coating Properties (LF & GF)

- NSS Corrosion Resistance > 1008 h
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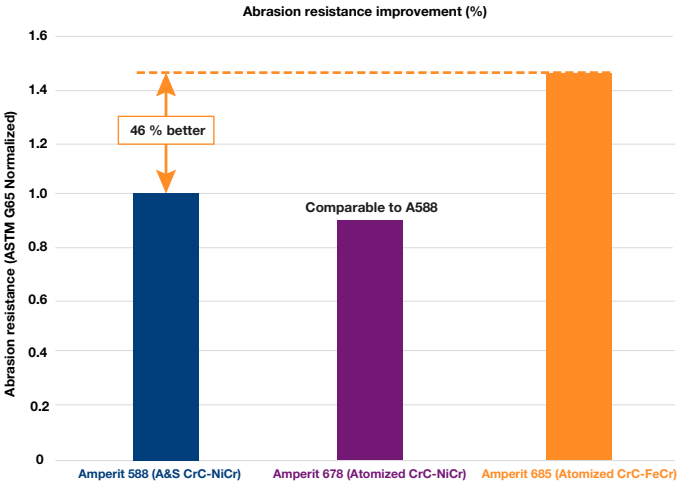
Microstructure of Amperit 685 coating



Improved wear properties of Amperit 685

For more information on Amperit 678 and Amperit 685, as well as other Höganäs products, please contact your local sales representative or scan/click the QR code to fill out a contact form.

www.hoganas.com

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