



# Carbonyl Iron Powder

## INTRODUCING BASF

# TRADITION MEETS INNOVATION



Since our very beginnings over 140 years ago, innovations are key to our success. During this time, we, as the world's leading chemical company, gained our reputation as a trustworthy partner to the industry.

We help our customers to be more successful – with a variety of products, services and intelligent system solutions. As a strategic partner, we support our customers in discovering business opportunities and in developing products, procedures and services.

**The key to success is  
innovation, combined with  
quality and tradition.**

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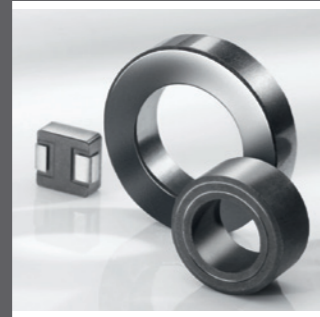


## BASF – THE INVENTOR OF CARBONYL IRON POWDER

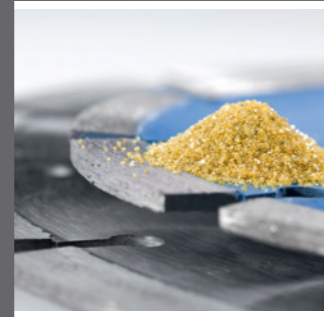
BASF is the inventor and the leading producer of Carbonyl Iron Powder (CIP) worldwide. Since more than 80 years, BASF develops the most varied areas of applications for CIP. The result: A broad spectrum of CIP grades including tailor-made special grades. A product portfolio of high and consistent quality CIP, managed by our global sales network, offering our customers personal contact, direct support and fast response.

**The carbonyl decomposition process for the production of Carbonyl Iron Powder was invented at BASF in 1925. CIP is produced at the world-scale production site in Ludwigshafen, Germany.**

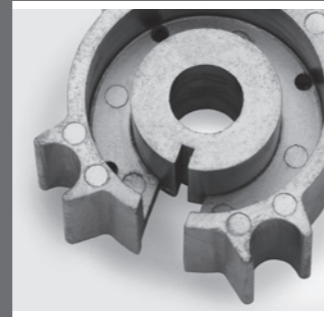
Inductive Electronic Components



Diamond Tools



Metal Injection Molding and Powder Metallurgy



Microwave and Radar Absorption



PROPERTIES & APPLICATIONS

The unique properties of Carbonyl Iron Powder (CIP) made by BASF open up a wide range of existing and future applications:

Its **exceptional fineness** and **spherical morphology** leads to excellent compaction and sintering properties. These properties are exploited in Diamond Tool Production, Metal Injection Molding, and conventional Powder Metallurgy.

Its **specific catalytic activity** is the key to the synthesis of high quality industrial diamonds.

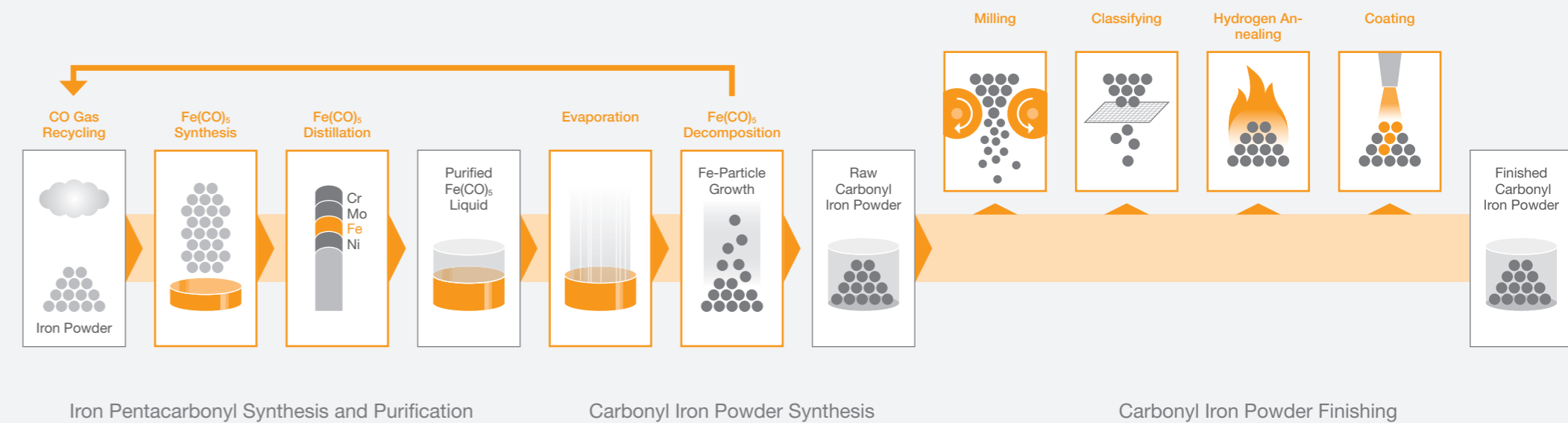
Its **outstanding magnetization behavior** is relevant for applications such as Inductive Electronic Components, Magnetorheological Fluids.

Its **unique micro structure** makes CIP an excellent absorber of microwave frequencies, enabling technologies from EMI shielding to radar absorption.

Its **unparalleled purity and consistent high quality** are the main reasons why many customers choose BASF's CIP.

THE PROCESS – FROM IRON TO CIP

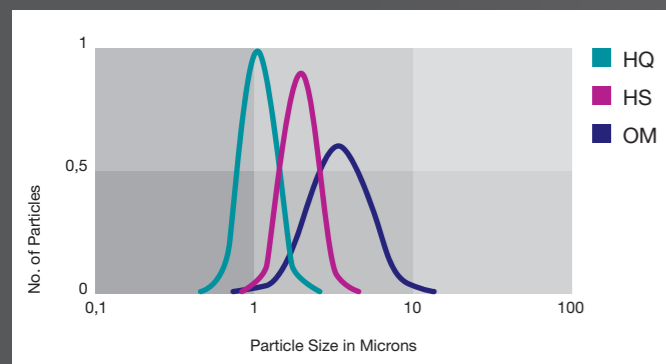
CIP is produced by thermal decomposition of iron pentacarbonyl ( $Fe(CO)_5$ ), which is previously distilled to high purity. In the course of the decomposition process, spherical iron layers form on a nucleus, thereby developing a shell structure. The decomposition conditions determine the main properties, including the particle size distribution of the intermediate products. The individual CIP grades are gained from these by a number of finishing processes like milling (desagglomeration of secondary particles), classifying (tailoring of particle size distribution), mixing, and coating.



## DIFFERENCE MATTERS

Our extensive expertise in the production of CIP allows us to accurately control the properties of our powders. In addition to our broad standard portfolio, we are able to develop CIP grades with properties, which exactly correspond to the precise requirements of the individual application. Generally, two product CIP groups can be distinguished: unreduced or “hard” grades and reduced or “soft” grades.

**Hard and soft grades are available with different particle size distributions:**

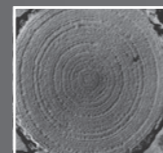


Plot of Microtrac X100 laser diffraction analysis



### Hard Grades

These grades are produced from the primary decomposition products without further chemical processing.

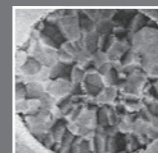


#### Typical properties of hard grades:

- Onion skin structure
- Mechanically hard
- Fe content up to 97.8 %
- Other elements (typically):  
C max. 1.0 %, N max. 0.9 %, O max. 0.5 %

### Soft Grades

These grades are produced by annealing of hard grades under hydrogen. In this process, the onion skin structure is lost, and the content of N, C, and O is reduced.



#### Typical properties of soft grades:

- Polycrystalline structure
- Mechanically soft
- Excellent compaction properties
- Fe content up to 99.8 %
- Low C, N, and O content



## CARBONYL IRON POWDER BY BASF – BENEFIT FROM TRADITION AND INNOVATION

#### CIP by BASF offers you:

Mean particle size < 10 microns

- Unparalleled chemical purity
- Excellent lot-to-lot consistency
- More than 80 years of experience in CIP production

#### BASF offers you:

- Reliability and sustainability offered by the world's leading chemical company
- Worldwide network of sales representatives
- Global R&D team with outstanding competencies in chemistry and processes

Please contact us to discuss the requirements of your CIP application.

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**Note**

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The Chemical Company



# Carbonyl Iron Powder

## Overview CIP product range

Grade	application	type	Fe min. (%)	C max. (%)	N max. (%)	O max. (%)	d50 value (microns)	coating
CIP EM	Electronic Components	hard	97.0	0.65–0.85	0.6–0.8	0.1–0.3	4.5–6	
CIP SQ	Electronic Components	soft	99.5	0.05		0.22	3.9–5.0	
CIP SQ-I	Electronic Components	soft	98.5	0.03		0.7	3.8–5.4	yes
CIP SW-S	Electronic Components	soft		0.4			3.0–4.5	yes
CIP SP-I	Electronic Components	soft	99.5	0.05			6–10	yes
CIP EW	Electronic Components & Microwave Absorption	hard	97.0	0.9	0.9		3.0–4.0	
CIP ER	Microwave Absorption	hard	97.0	1.0	1.0	0.8	4.5	
CIP ES	Microwave Absorption	hard	97.4	1.1	1.2	0.6	3.4–4.5	
CIP EW-I	Microwave Absorption	hard	97.0	0.9			3.0–4.0	yes
CIP OM	Metal Injection Molding	hard	97.8	0.75–0.90	0.65–0.90	0.15–0.40	3.9–5.2	
CIP OS	Metal Injection Molding	hard	97.5	0.7–0.9	0.5–0.9	0.6–0.9	3.4–4.4	
CIP CC	Metal Injection Molding & powder Metallurgy	soft	99.5	0.05	0.01	0.18–0.35	3.8–5.3	
CIP CM	Powder Metallurgy	soft	99.5	0.03	0.01	0.1–0.25	7.0–9.5	
CIP CS	Powder Metallurgy	soft	99.5	0.03	0.01	0.12–0.30	6.0–7.0	
CIP CN	Powder metallurgy & Diamond Synthesis/Tools	soft	99.5	0.03	0.01	0.10–0.25	6.5–8.0	
CIP SM	Diamond Tools	soft	99.0	0.1	0.1	0.55	3.5	
CIP EN	Diamond Tools	hard	97.5	0.9	1.0	0.6	3.9–5.2	
CIP OF	Nutritional Supplement	hard	97.0	1.3	0.3	1.4	5.2	
CIP CF	Nutritional Supplement	soft	99.5	0.03	0.01	0.23	9.5	
ZVI MICROS- PHERES 200	Groundwater Remediation	hard	97.5	1.0	1.0	0.5	5.2	
CIP FM	Other	hard	97.5	1.0	1.0	0.5	2.5	
CIP HF	Other	hard	97.7	0.9	0.9	0.5	2.5	
CIP HQ	Other	hard	97.8	0.6–0.9	0.6–0.9	0.3–0.5	2.0	
CIP HS	Other	hard	97.5	1.0	1.0	0.5	1.8–2.3	

### Note

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