

Magnequench[®]

A Division of Neo Material Technologies Inc.

Leading Magnet Innovation[™]

Very Fine Powders (MQFP)

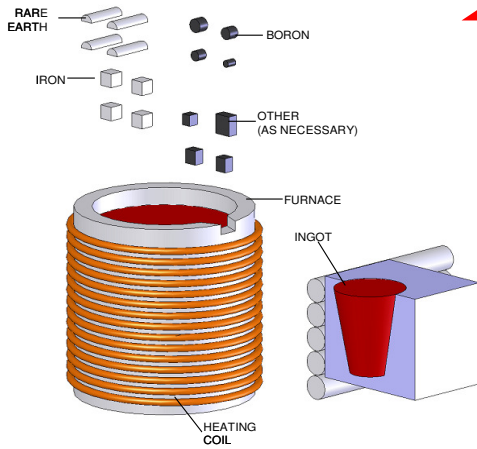
2009

- Technology applicable to all MQP powder grades
- Will design new powder grades suitable for new applications
- Target applications
 - Flexible magnets
 - Labeling, signs, displays, advertising premiums
 - Door gaskets, cabinets closures
 - Micromotors and CRT focusing
 - Security devices
 - Small tool and instrument holders
 - Sensors
 - Small injection molded magnets
 - Micro magnets

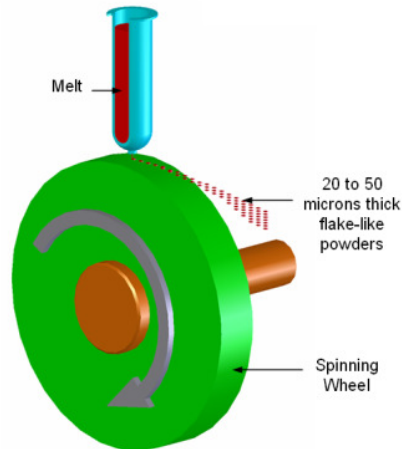
Process

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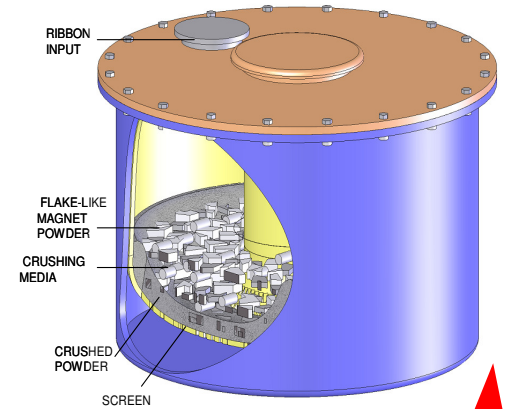
Alloying



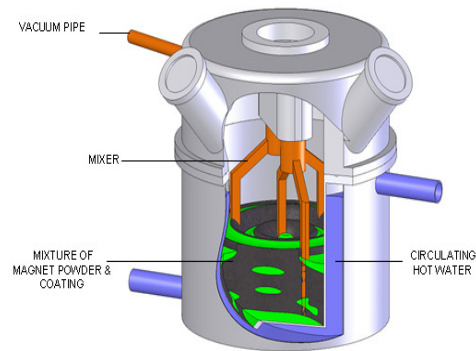
Jet Casting



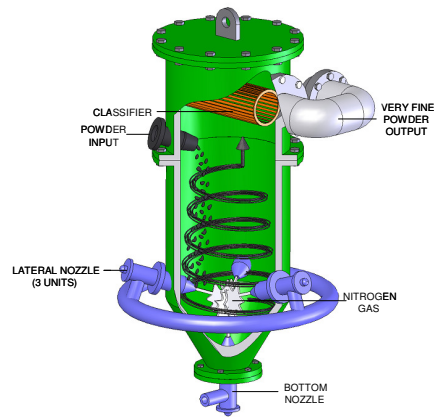
Coarse Crushing



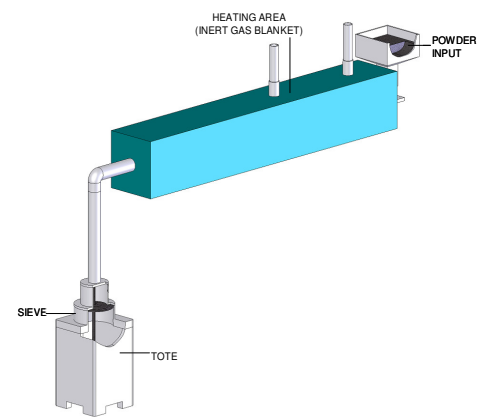
Coating



Jet milling

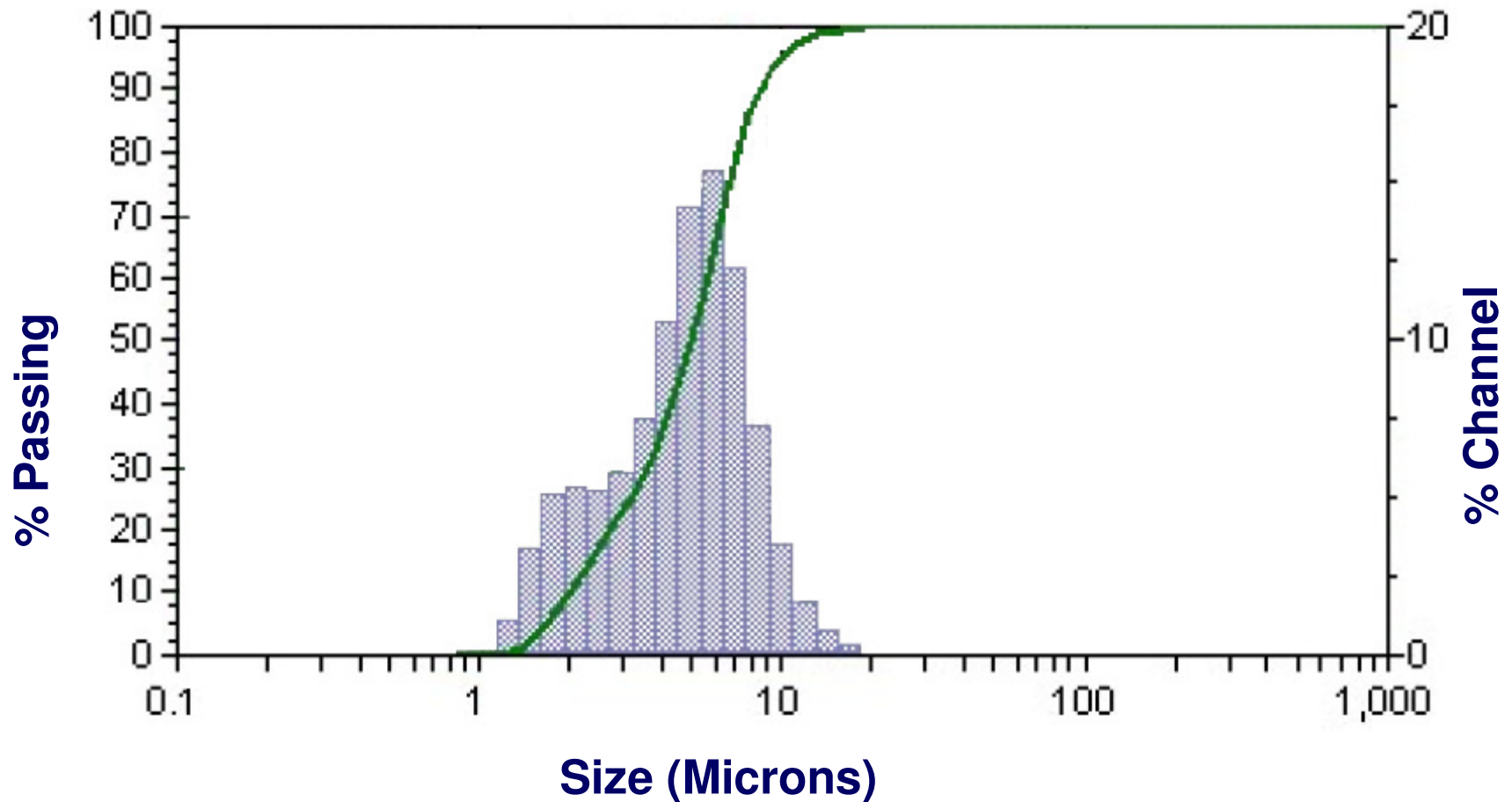


Annealing

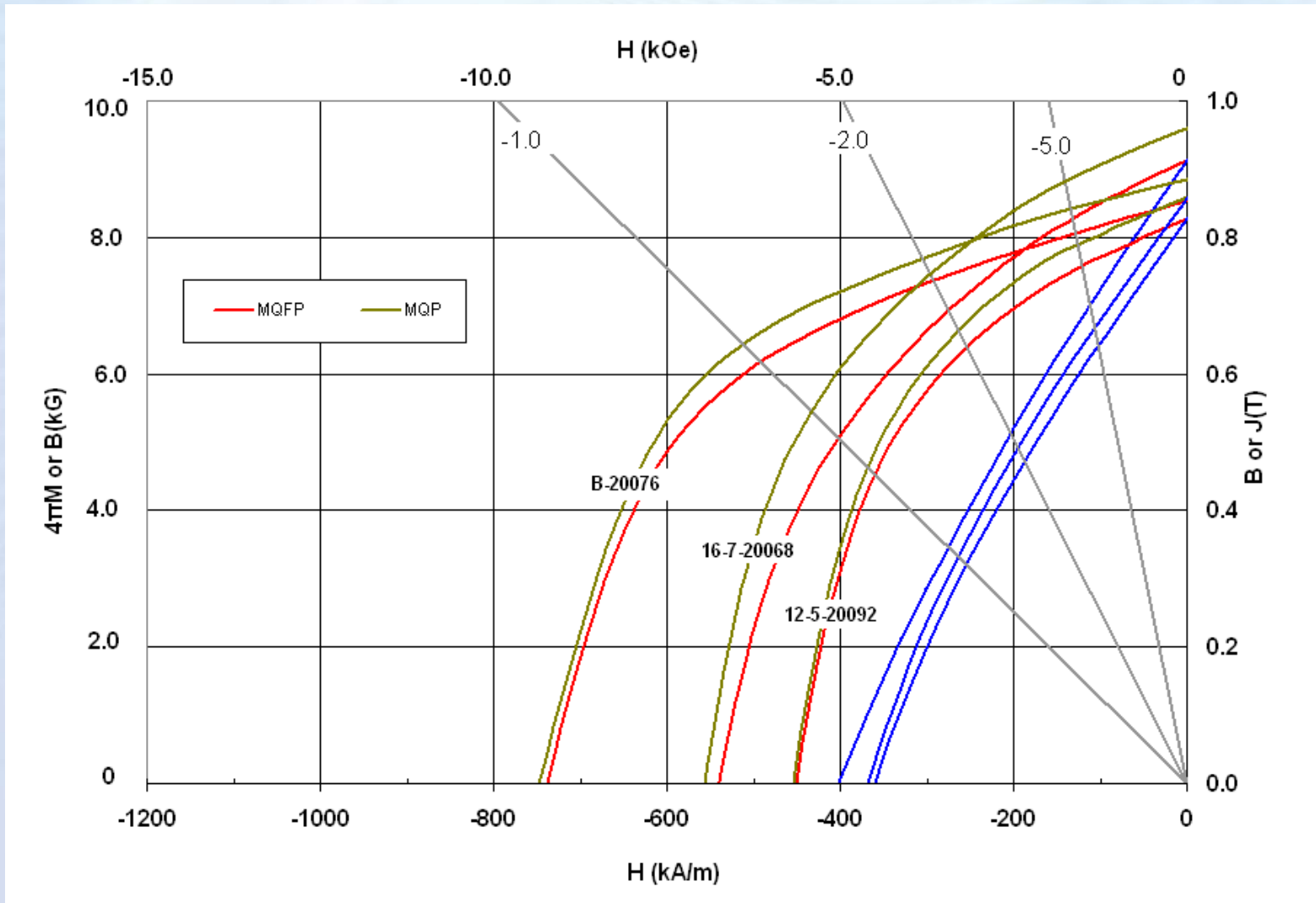


Microtrac Particle Analyzer

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MQFP Powders

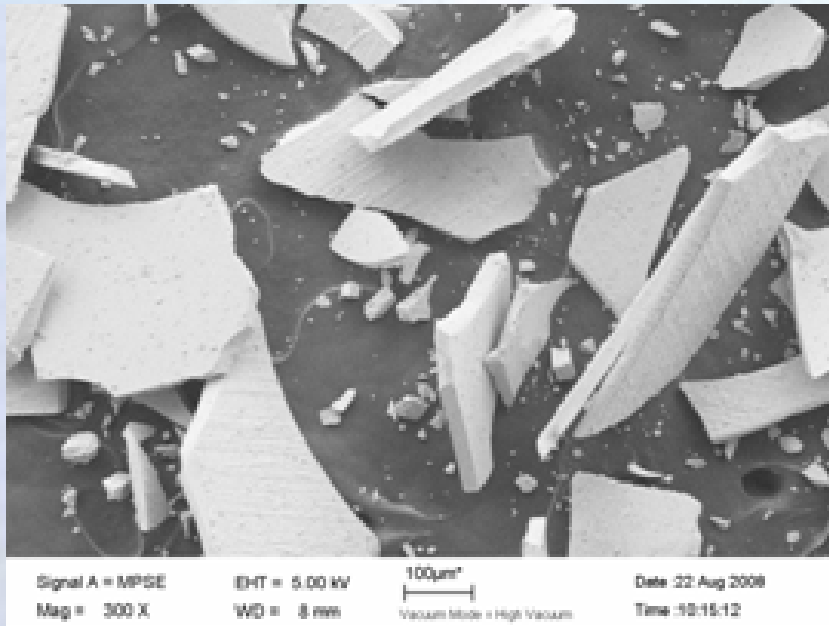


Magnequench

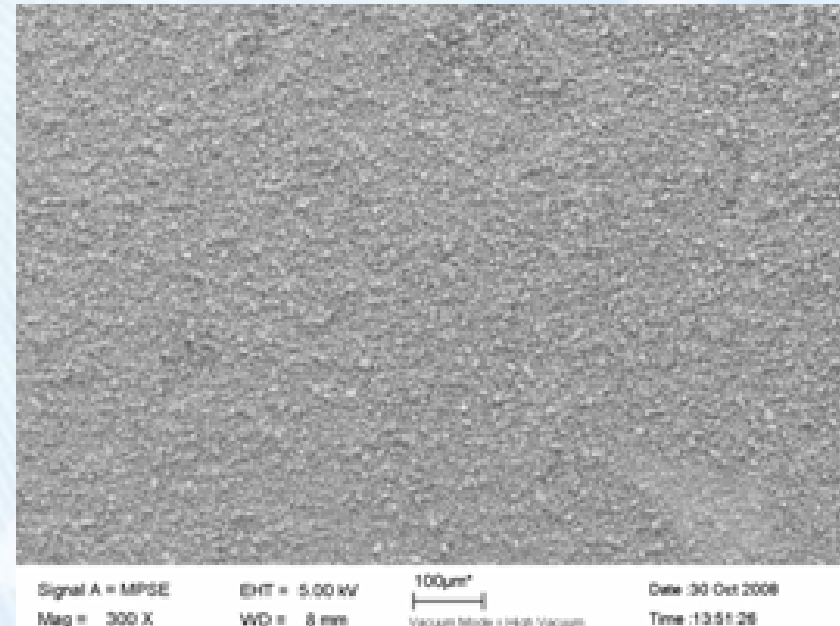
Very Fine Powder
(For all MQPTM Powder Grades)

SEM pictures

Scale: 100μm



MQP

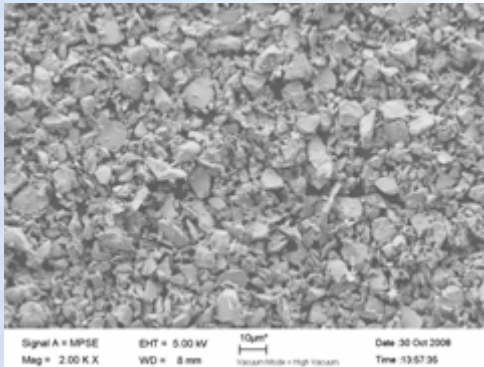


MQFP

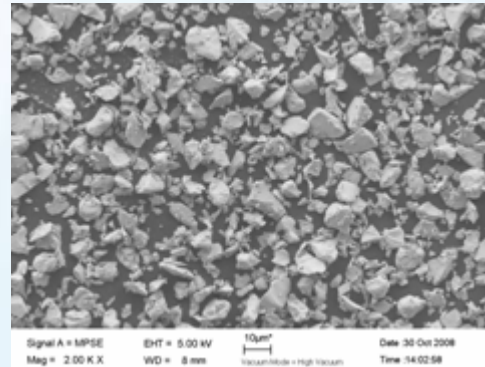
- MQFP has much smaller PSD values

SEM pictures: MQFP

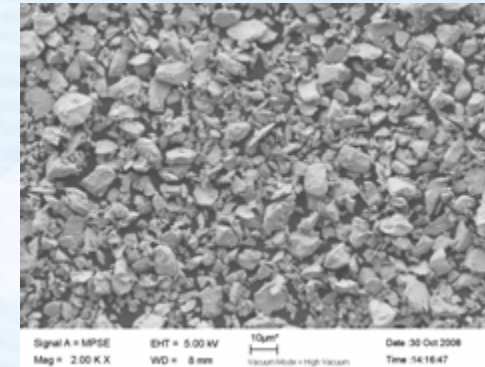
B+-10184



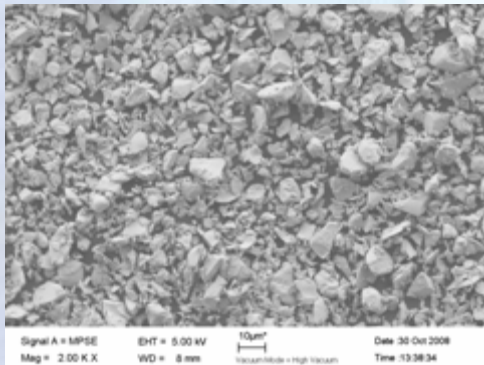
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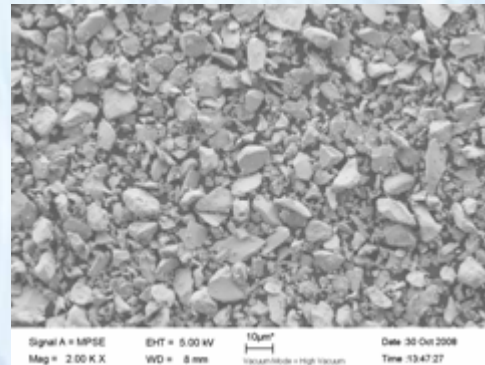
B-20076



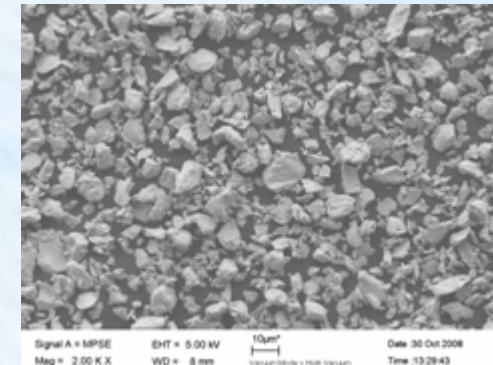
14-12-20000



15-7-20065



16-7-20068



Scale: 10µm

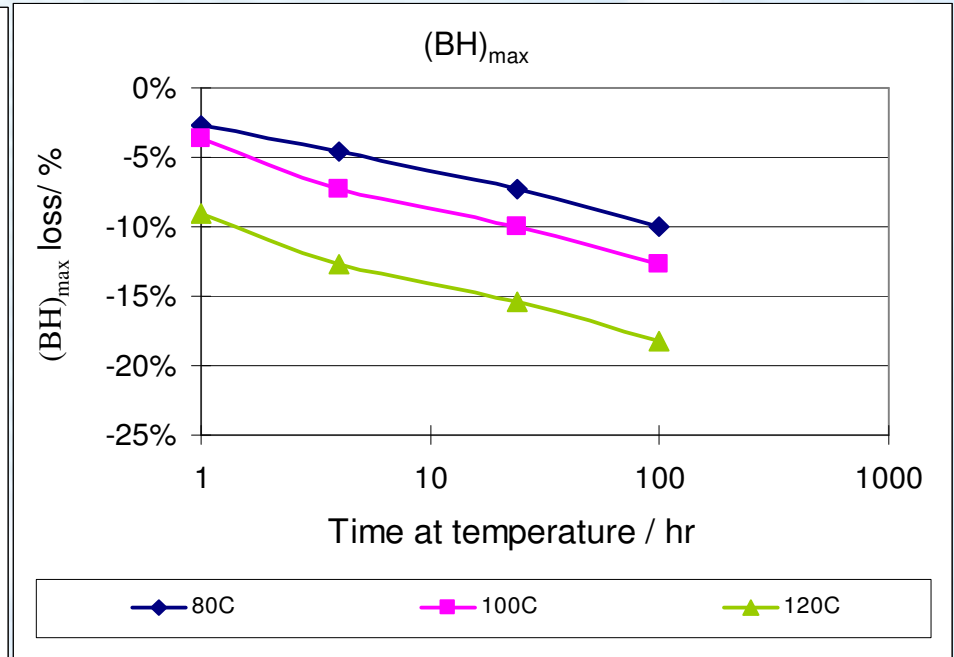
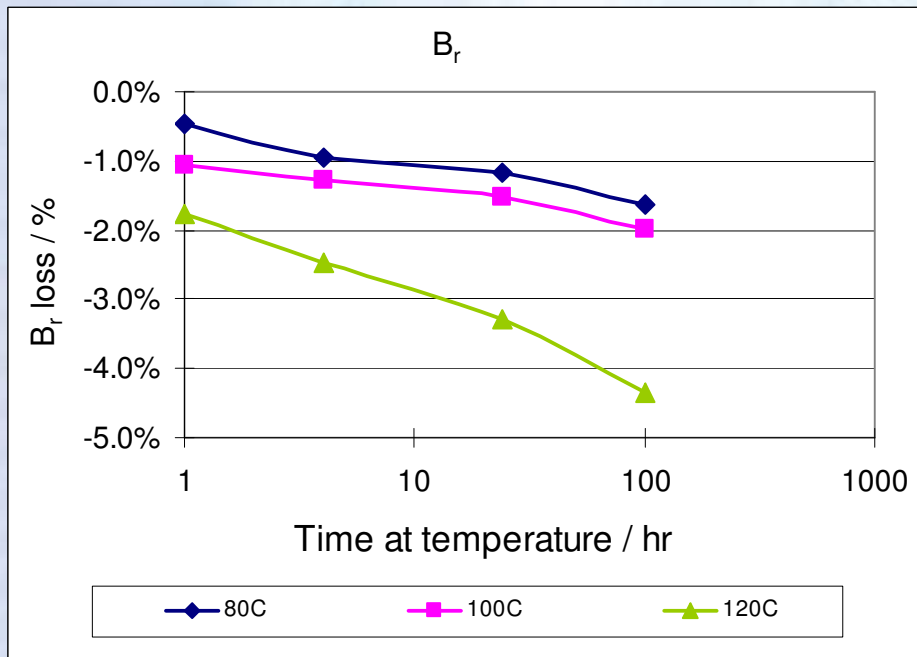
- All powders show a similar surface morphology

Very Fine Powder (MQFP-B-20076) Physical Characteristics

MQFP-B-20076-089 (D50=5 microns)					
Powder magnetic characteristics					
Specified		SI		CGS	
Residual Induction, B_r		835-865	mT	8.35-8.65	kG
Energy Product, $(BH)_{max}$		103-115	kJ/m^3	12.9-14.4	MGOe
Intrinsic Coercivity, H_{ci}		710-770	kA/m	8.9-9.7	kOe
Typical					
Coercive Force, H_c		490	kA/m	6.2	kOe
Temperature coefficient of B_r , α , to 100 °C		-0.15	%/ °C		
Temperature coefficient, H_{ci} , β , to 100 °C		-0.37	%/ °C		
Curie Temperature, T_C		315	°C		
Maximum Process Temperature		120-150	°C		
Physical characteristics					
Specified					
Laser Particle Size Analysis:					
D90		< 10 microns			
D50		≤ 6 microns			
D10		< 2.5 microns			
Typical					
Density (theoretical)		7.5	g/cm^3		
Apparent Density		1.69	g/cm^3		

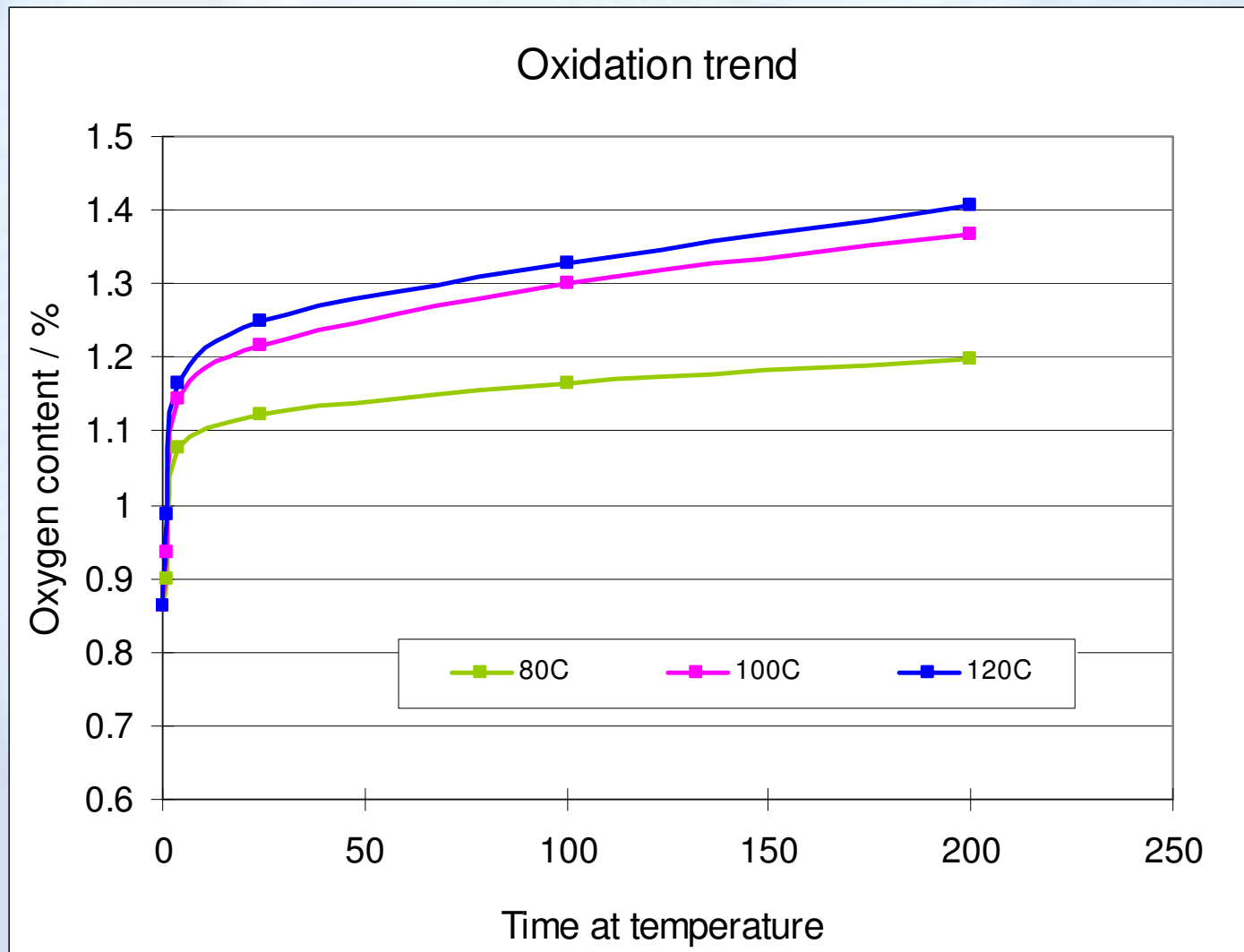
Very Fine Powder (MQFP-B-20076)

Reactivity to air



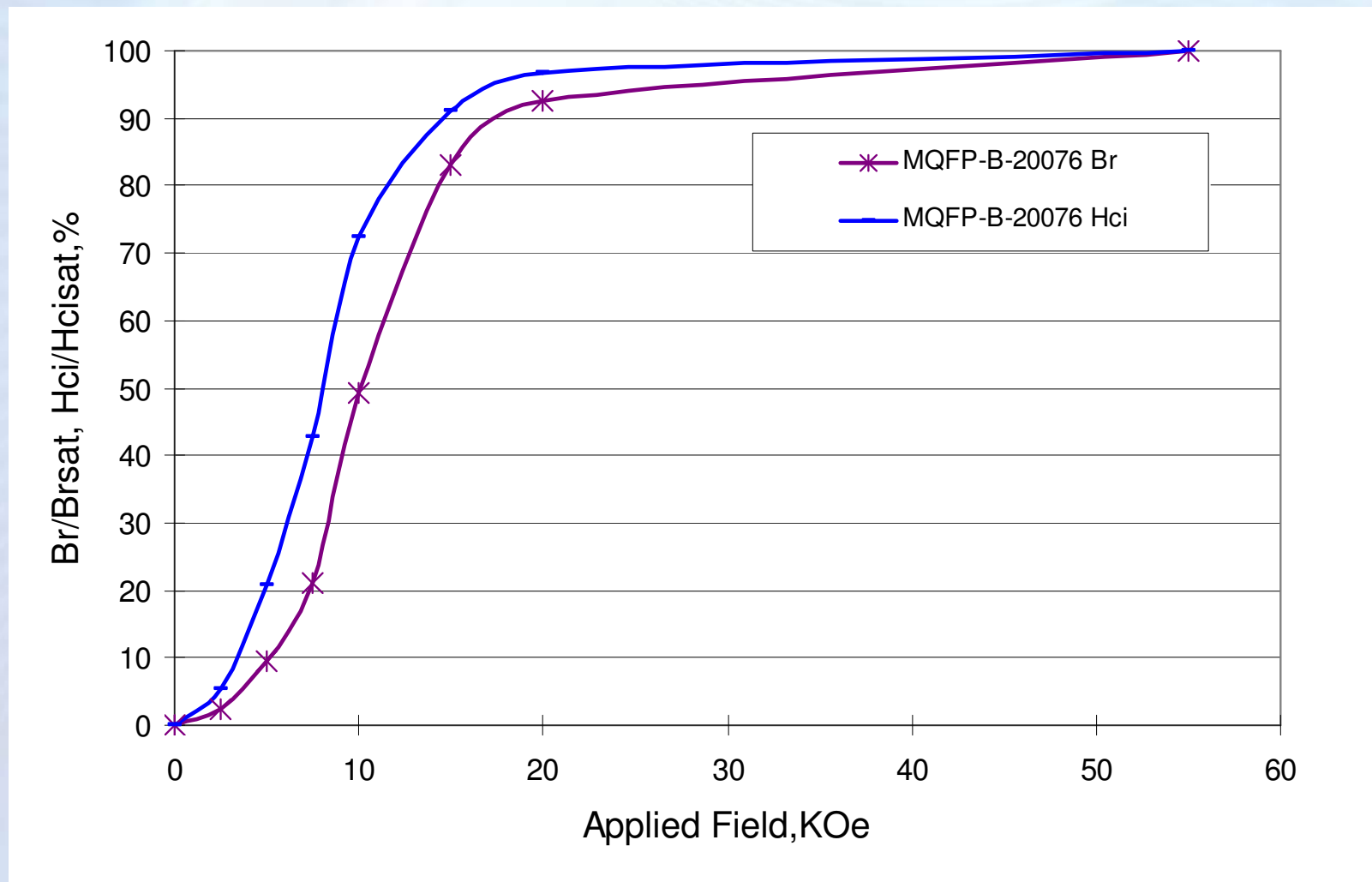
- Data for unmagnetized powder heated in oven
- Powder is tested by VSM after each period of time

Very Fine Powder (MQFP-B-20076) Oxidation Trend



Very Fine Powder (MQFP-B-20076) Magnetization Curve

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Easy to Magnetize Powder
MQFP-12-5

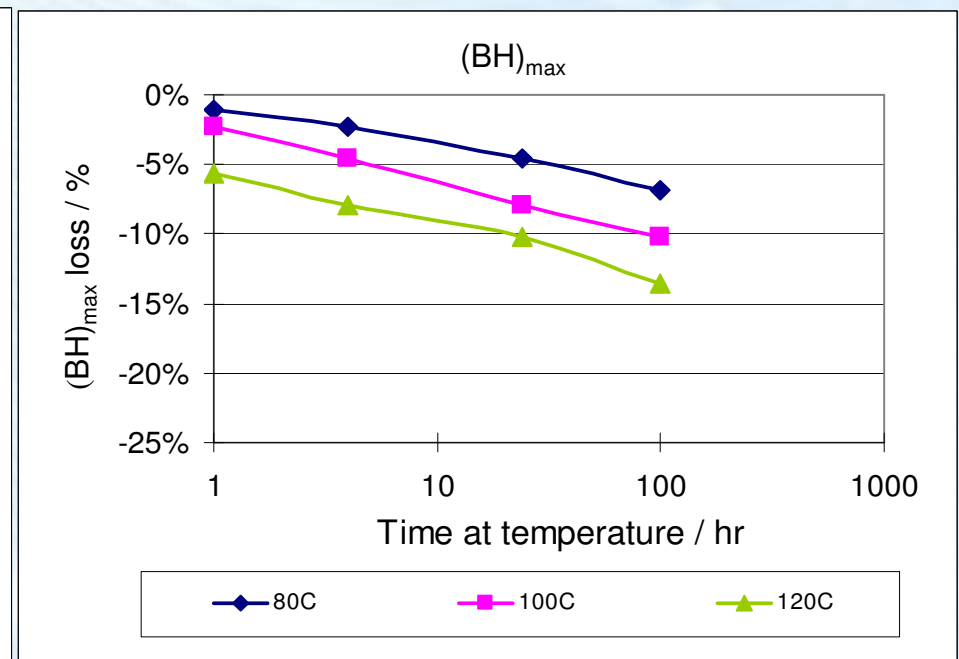
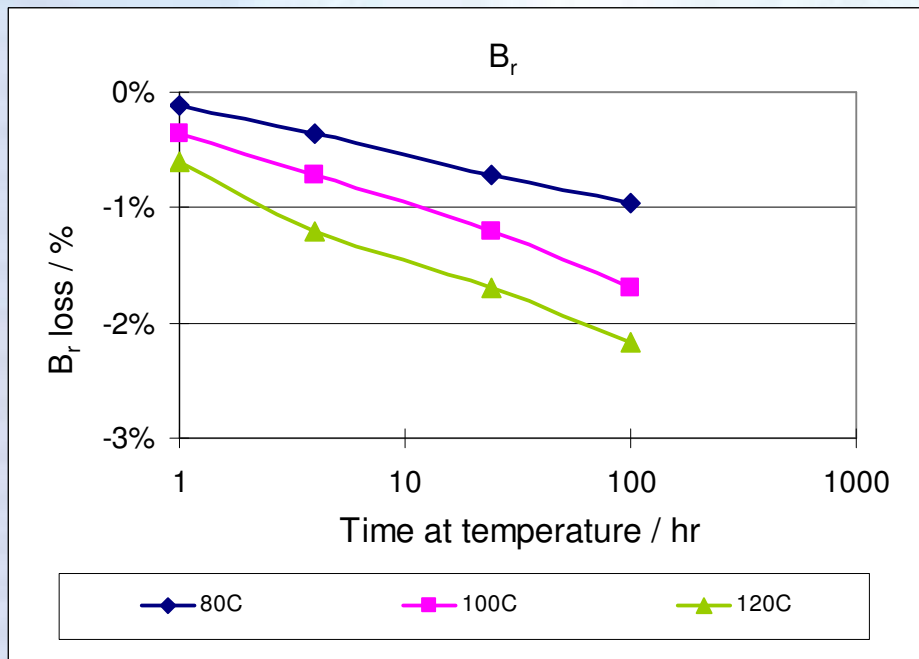
Easy to Magnetize Powder (MQFP-12-5) Physical Characteristics

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MQFP-12-5-20092-089 (D50=5 microns)			
Powder magnetic characteristics			
Specified		SI	CGS
	Residual Induction, B_r	805-835 mT	8.05-8.35 kG
	Energy Product, $(BH)_{max}$	81-93 kJ/m ³	10.2-11.7 MGOe
	Intrinsic Coercivity, H_{ci}	410-470 kA/m	5.2-5.9 kOe
Typical			
	Coercive Force, H_c	360 kA/m	4.5 kOe
	Temperature coefficient of B_r , α , to 100 °C	-0.17 %/ °C	
	Temperature coefficient, H_{ci} , β , to 100 °C	-0.42 %/ °C	
	Curie Temperature, T_C	265 °C	
	Maximum Process Temperature	150-175 °C	
Physical characteristics			
Specified			
	Laser Particle Size Analysis:		
	D90	<10 microns	
	D50	≤ 6 microns	
	D10	< 2.5 microns	
Typical			
	Density (theoretical)	7.53 g/cm ³	
	Apparent Density	1.67 g/cm ³	

Easy to Magnetize Powder (MQFP-12-5) Reactivity to air

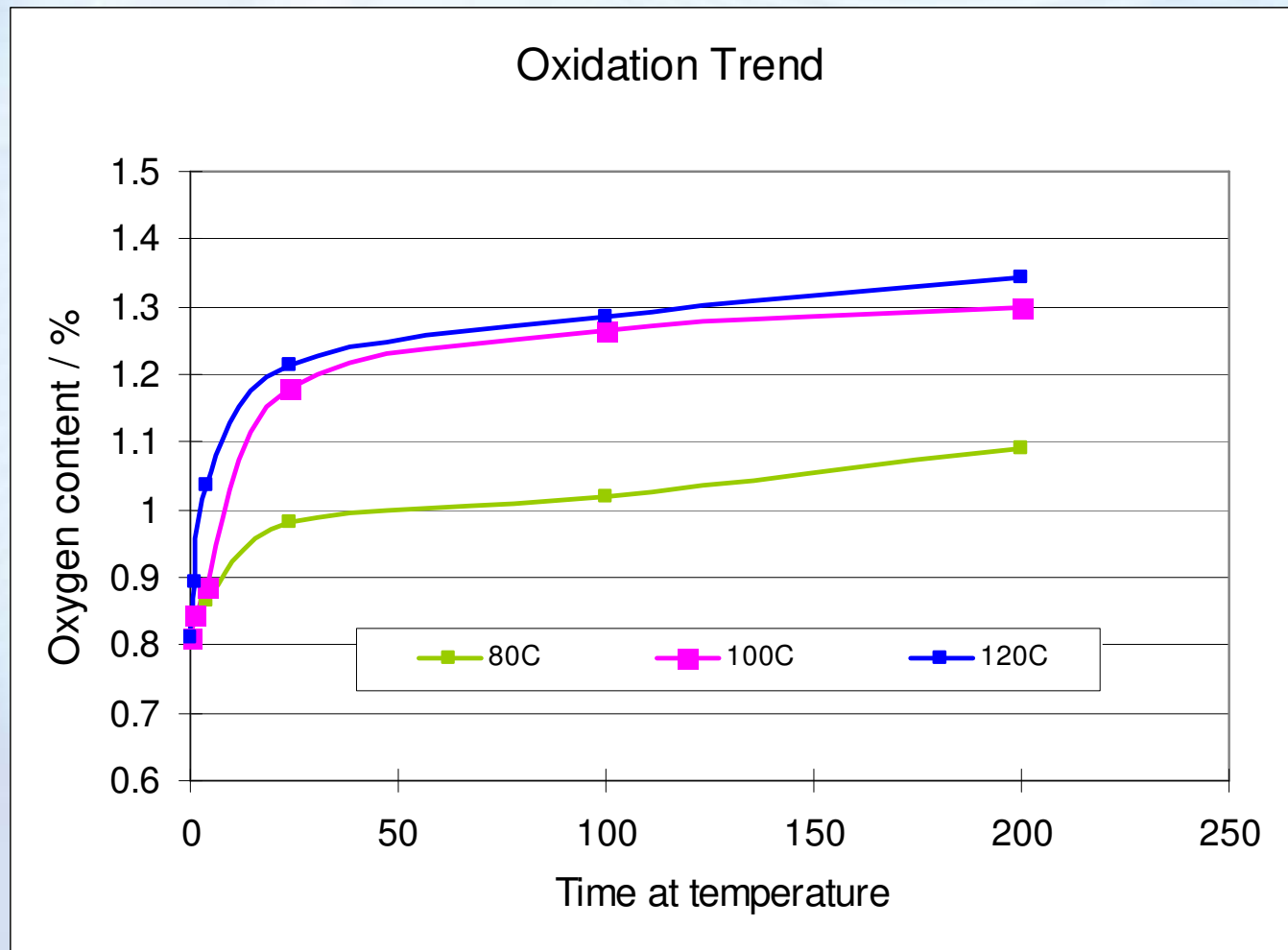
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- Data for unmagnetized powder heated in oven
- Powder is tested by VSM after each period of time

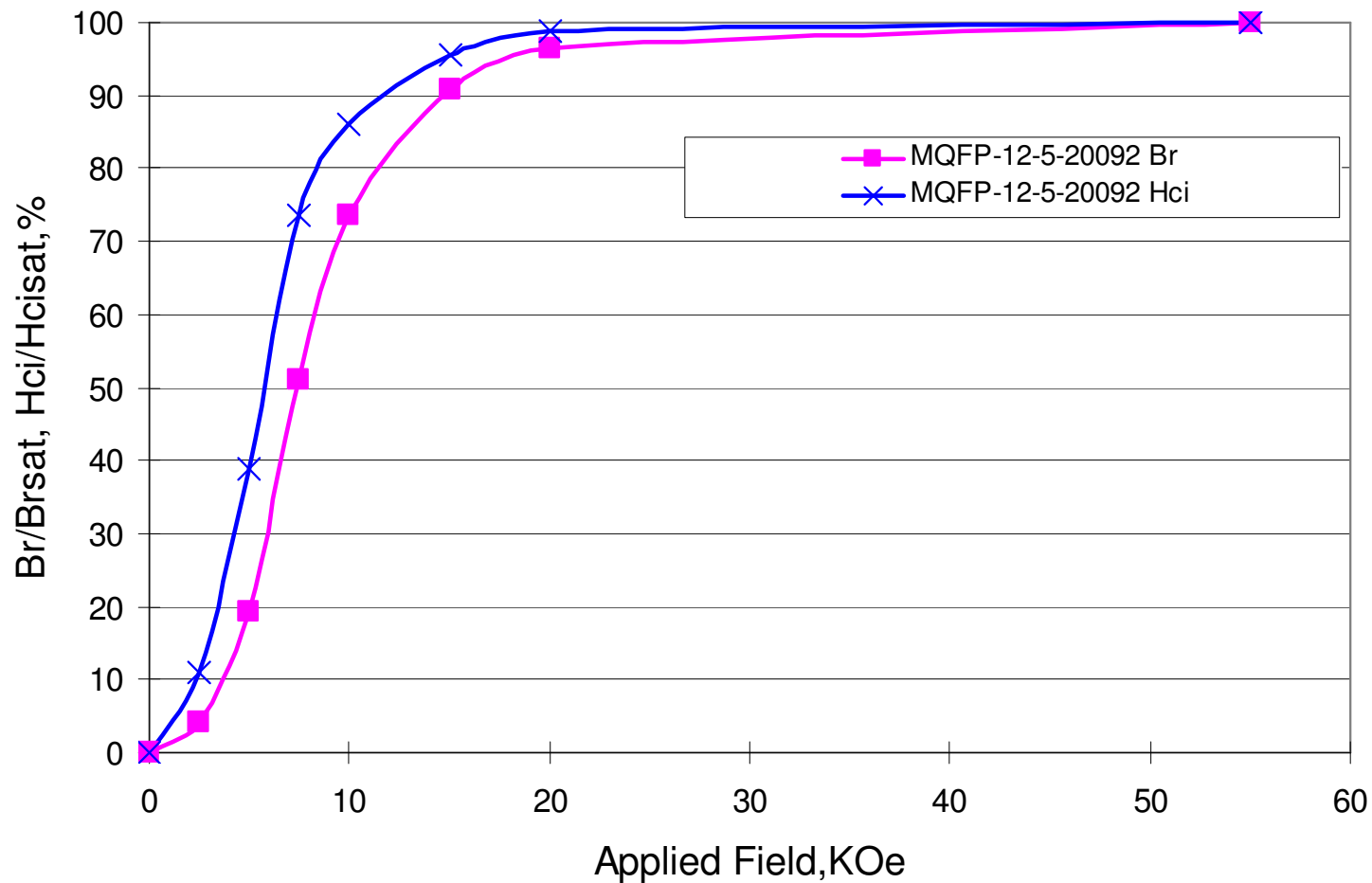
Easy to Magnetize Powder (MQFP-12-5) Oxidation Trend

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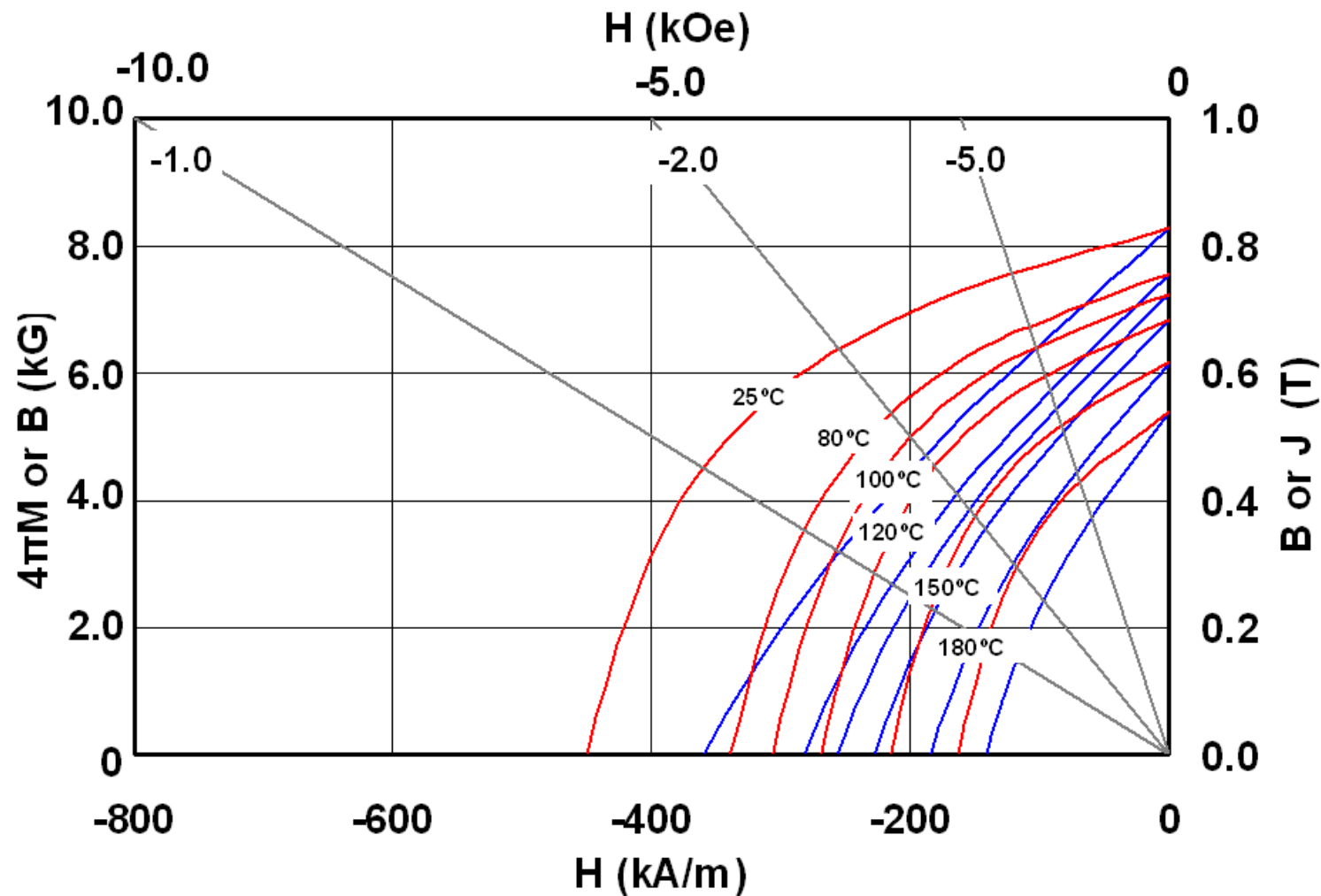
Easy to Magnetize Powder (MQFP-12-5) Magnetization Curve

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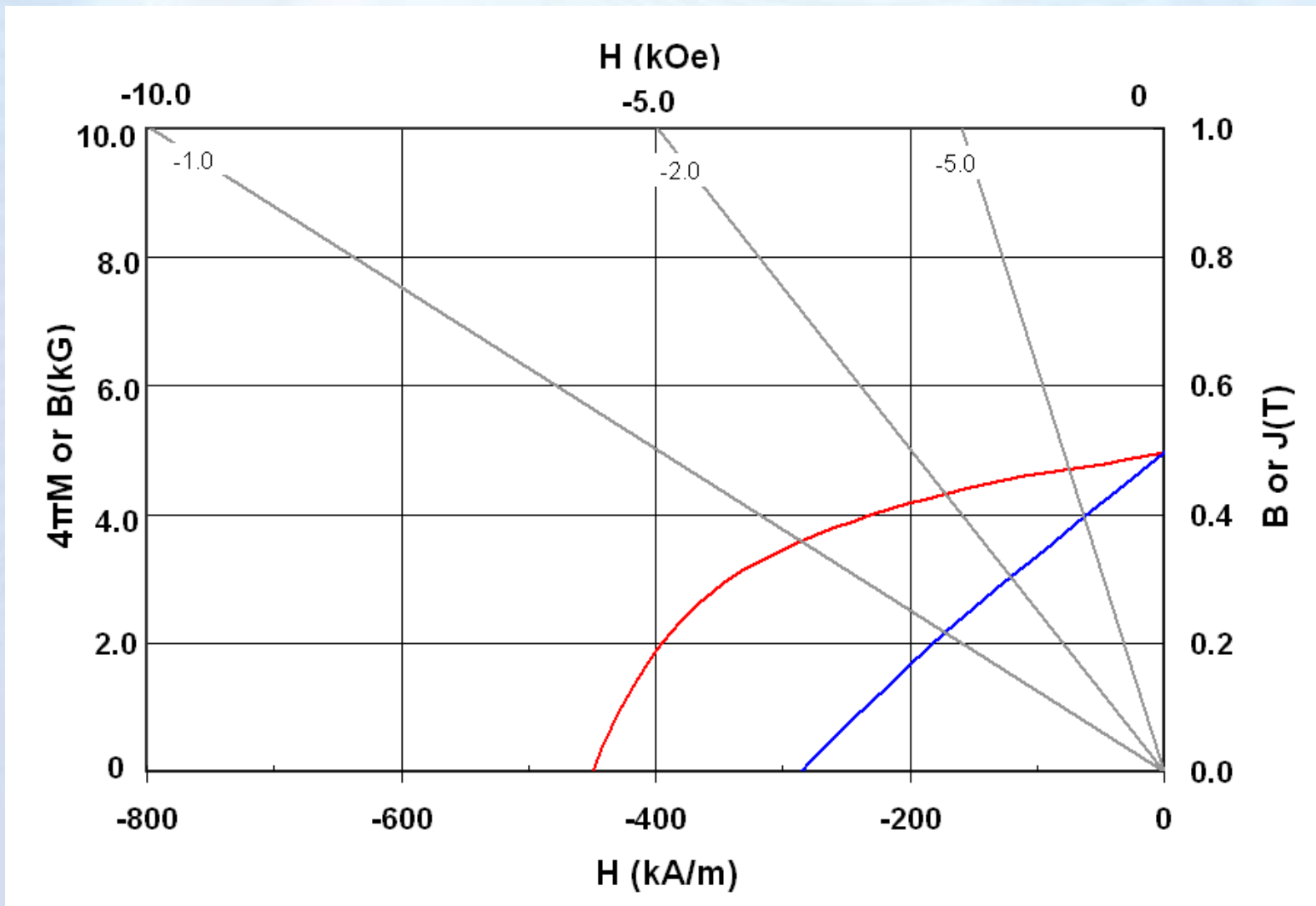
Easy to Magnetize Powder (MQFP-12-5) VSM

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Easy to Magnetize Powder (MQFP-12-5) Estimated Magnet Curves

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Projected Magnet Properties

- Based on 60 volume percent loading
 - Calendering
 - Micro Injection molding

VFP Magnets		MQFP-B	MQFP-16-7	MQFP-12-5
Part Number		20076-089	20068-089	20092-089
Magnet Br	mT kG	510 5.1	550 5.5	490 4.9
Magnet (BH)max	kJ/m ³ MGOe	44 5.6	45 5.7	38 4.8

VSM Data

Sample ID	PSD / microns			
	Mv	D10	D50	D90
F00001 MQFP-12-5 (D50=5 microns) 20092-089	5.63	2.05	5.39	9.20
F00002 MQFP-B (D50=5 microns) 20076-089	5.17	1.96	4.98	8.39
F00003 MQFP-16-7 (D50=5 microns) 20068-089	5.73	2.05	5.51	9.41
F00005 MQFP-12-5 (D50=5 microns) 20092-089	5.32	2.00	5.10	8.70
F00006 MQFP-15-7 (D50=5 microns) 20065-089	5.35	2.00	5.12	8.78
F00007 MQFP-B (D50=5 microns) 20029-089	5.18	1.92	4.84	8.58
	Spec	1.5-2.5um	4.5-6.5um	< 10um

