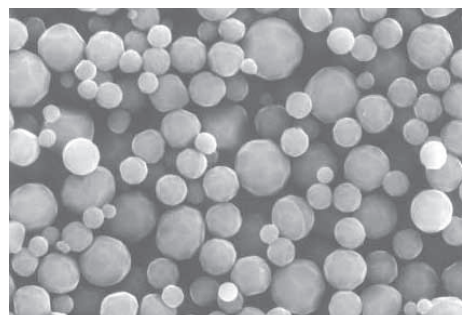
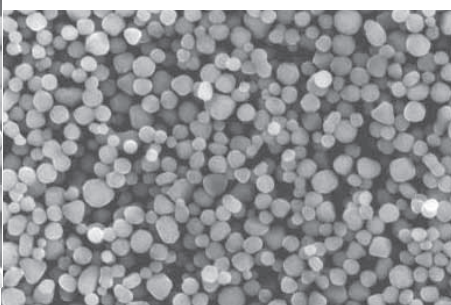


Nickel Ultra Fine Powder

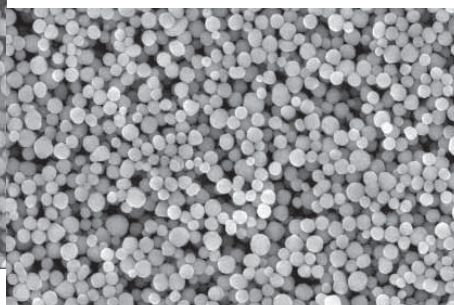
The new CVD technology leads to the ultra fine powder,
It's a key for the higher performance of advanced electronic parts and components.



NFP 401 (average diameter:0.4 μm)



NFP201S (average diameter :0.2 μm)



Development (average diameter:0.2 μm
coarse particle0.6 μm cut)



Characteristics

- ① Spherical shape
- ② Precisely controlled particle size average diameter: 0.1-0.5 μm
- ③ Sharp particle size distribution geometric standard deviation: 1.3-1.5
- ④ High crystallinity average crystalline size > 0.1 μm
- ⑤ Stable surface covered by approx., 3 nm-thick oxidised film
- ⑥ Smooth surface
- ⑦ High purity Ni > 99.9%



Applications

Internal electrode of multilayer ceramic capacitor
Electrode material for other electronic parts and components, etc.

Properties of Commercial Products (examples)

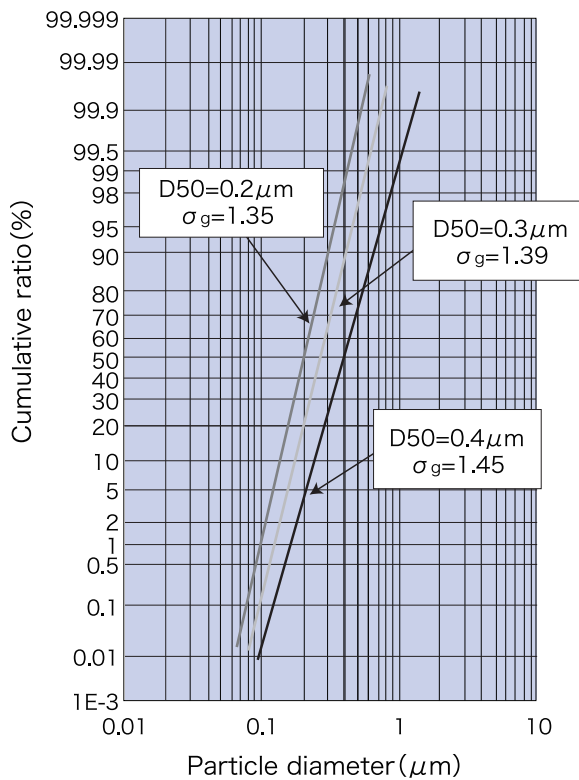
Product	Average diameter (μm)	Specific surface area (m ² /g)	Tap density (g/cm ³)	Number of coarse particle (arbitrary unit)
NFP401	0.4	1.7	3.9	
NFP401S	0.4	1.7	3.9	d ≥ 2 μm : ≤ 3
NFP301S	0.3	2.6	3.5	d ≥ 2 μm : ≤ 2
NFP201	0.2	3.4	3.0	
NFP201S	0.2	3.4	3.4	d ≥ 2 μm : ≤ 3
NFP201X	0.2	3.7	3.7	d ≥ 0.8 μm : ≤ 6

Chemical composition (wt,%)

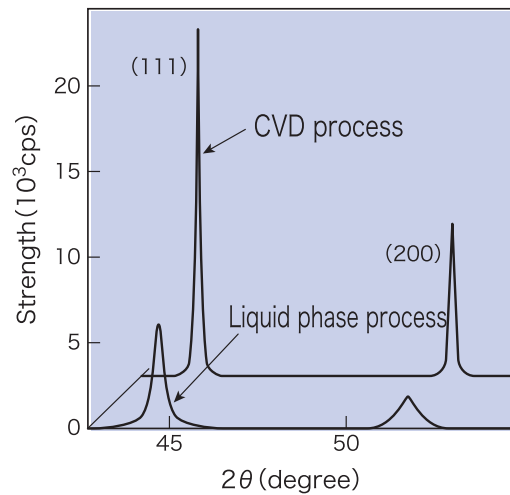
Ni	Fe	Co	Mn	Cr	Na	K	Cl	O	C
> 99.9	0.005							0.8	0.06
	}	0.002	0.001	0.001	0.001	0.001	0.002	}	}
(excl.0)	0.002							0.3	0.04



■ Particle size distributions (examples)



■ X-ray Diffraction pattern



■ Oxidation profile in air (heating rate: 20°C /min)

Average diameter (μm)	Weight increase temperature (°C)	
	1% increase	50% increase
0.4	380	510
0.3	350	460
0.2	300	430

Note: weight increase % is normalized by the total weight increase.

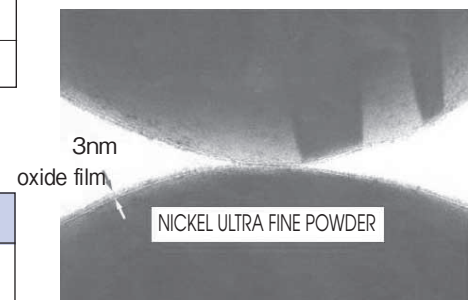
■ Shrink profile in reduction atmosphere (heating rate: 20°C /min)

Average diameter (μm)	Shrinkage temperature (°C)	
	1% shrinkage	50% shrinkage
0.4	590	700
0.3	560	680
0.2	510	620

Note: shrinkage % is normalized by the total shrinkage.

■ Moisture, oxidised film

Average diameter (μm)	Moisture (%)	Oxidised film (nm)
0.2, 0.3, 0.4	< 0.1	2 ~ 3



※This product is a strategic material (or service) under the provisions of the Law on Foreign Exchange and Foreign Trade and the Ordinance for Export Trade. Therefore, an export license by the Government of Japan is required for its export out of Japan.



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