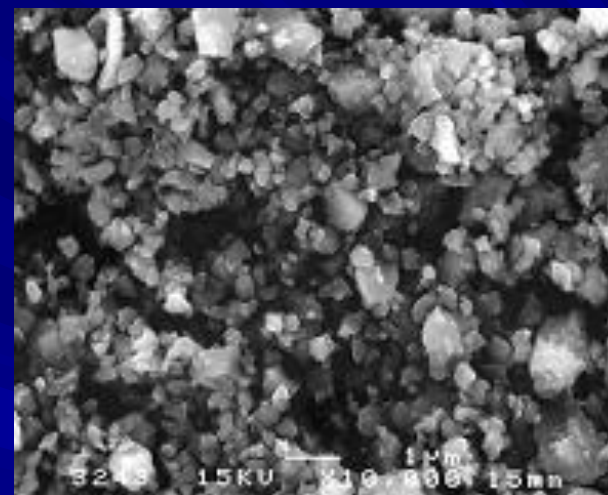


DENKA Silicon Nitride Powder



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2. Silicon Nitride Powder

① Features

- ◆ Silicon nitride powder for sintering use is lightweight, having excellent high temperature strength and fracture toughness and excellent characteristics such as resistance to wear, corrosion, and thermal shock, etc.
- ◆ It is a material which has possibility in an automotive engine parts, an electronic parts, an industrial machining parts, various composite materials, so on .

② Uses

- ◆ **Thermomotor Parts** : Automotive engine parts , gas turbine parts , etc.
- ◆ **Machining Parts** : Cutting tools , bearings, etc.
- ◆ Corrosion resistance parts : Molten aluminum-related jigs and components , etc.
- ◆ **General industrial parts** : Wear resistant components , high temperature insulated components , heat resistant containers such as setters , heat resistant jigs , etc.
- ◆ **Material for resin filling** : Wear resistant filler , thermal conductive filler , etc.

DENKA / SN-9S Main Application !

◆ Semiconductor Parts



◆ Ceramic substrate



Suitable application for SN-9FWS

◆ Machining Parts

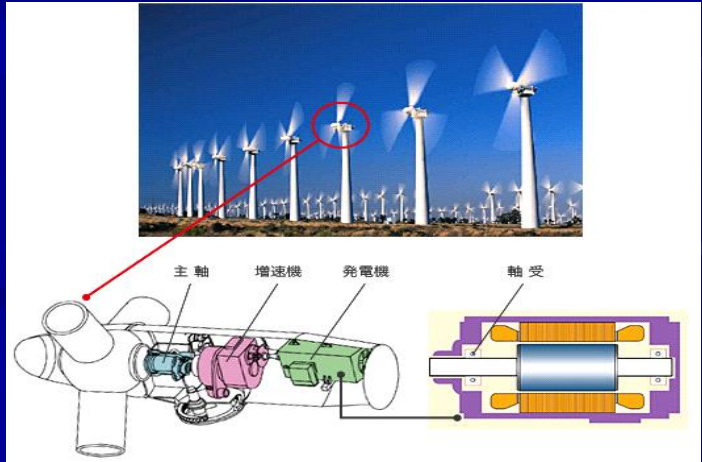
★ Cutting tools



★ Bearing ball



• Machine tool (Small ball)



• Wind velocity generation (Large ball)

③ Process

Silicon nitride powder produced by next processes is on the market in these days.

<Method>	<Reaction>	DENKA's Process
1) <u>Direct nitridation</u>	$3\text{Si} + 2\text{N}_2 \rightarrow \text{Si}_3\text{N}_4$	
2) Decomposition Process of Imide	$3\text{SiCl}_4 + 16\text{NH}_3 \rightarrow 3\text{Si}(\text{NH})_2 + 12\text{NH}_4\text{Cl}$ $3\text{Si}(\text{NH})_2 \rightarrow \text{Si}_3\text{N}_4 + \text{N}_2 + 3\text{H}_2$	

◆ Direct nitridation

<Advantage>

- Cost advantage (against Decomposition Process of Imide)
- Particle size control technology
→ Break down process

3. DENKA Silicon Nitride Powder Grade Lineup

◆ Characteristics

(Typical Data)

G grade Item		α -Type			β -Type	
		SN-9	SN-9S	SN-9FW S	SN-F1	SN-F2
α -Phase Content	(%)	90	91	91	<5	<5
d50	(μm) ^{*1}	4.2	1.1	0.7	2.4	28.4
Specific Surface Area	(m^2/g) ^{**2}	6	7	12	3	1
Fe	(μppm)	2,000	2,000	160	2,000	2,000
Al	(μppm)	1,000	1,000	900	1,000	1,000
Ca	(μppm)	2,000	2,000	1,000	1,000	1,000
C	(%)	0.1	0.1	0.1	-	-
O	(%)	1.2	1.5	0.8	-	-
Specific Gravity		3.18			3.19	
Thermal Stability		Sublimating at 1900°C				
External Appearance		Gray or Light-gray Powder				

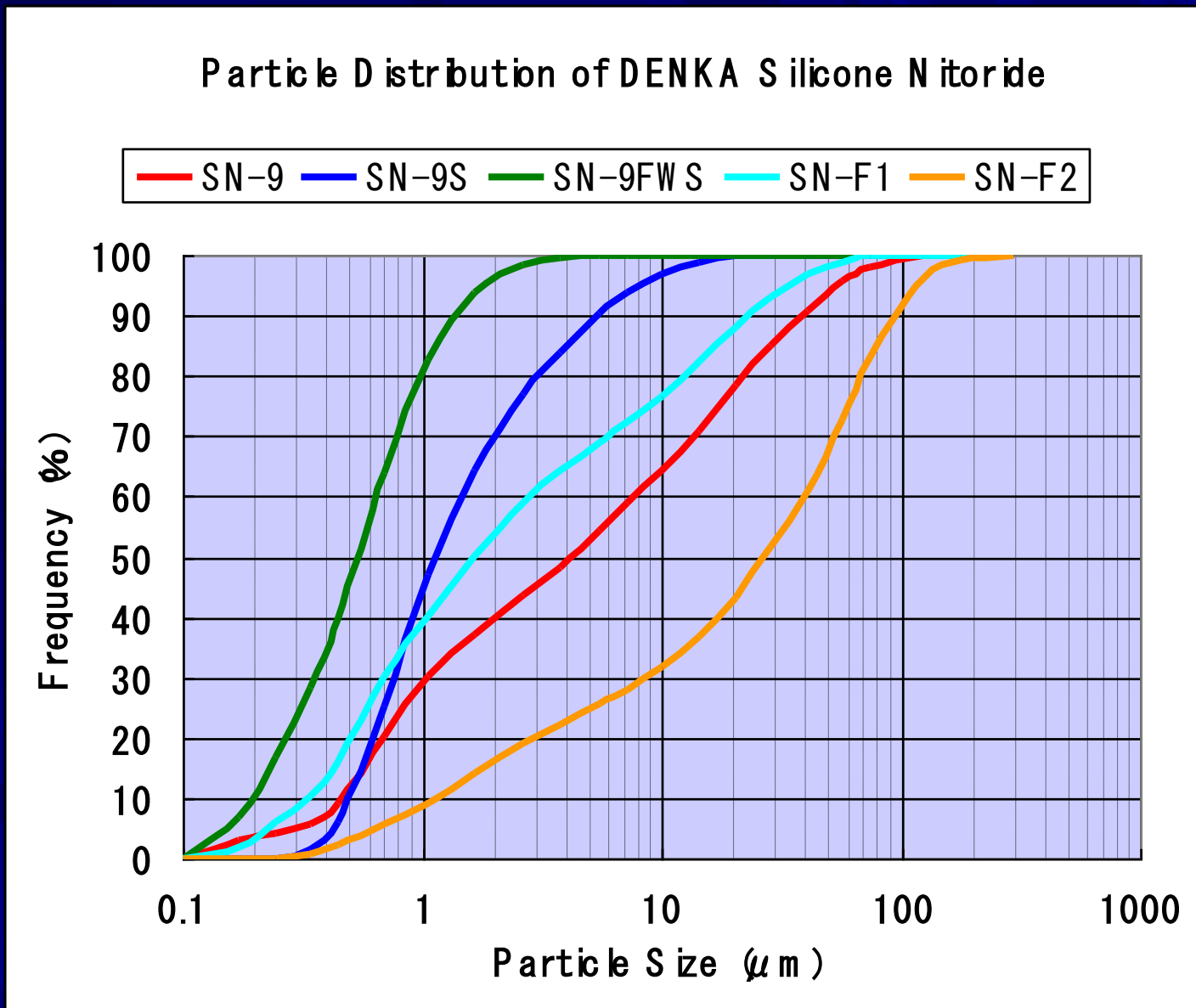
Values in the table are representative values and not standard values.

* Average Particle Size : measured data by LASER diffraction, dispersion method (micro track)

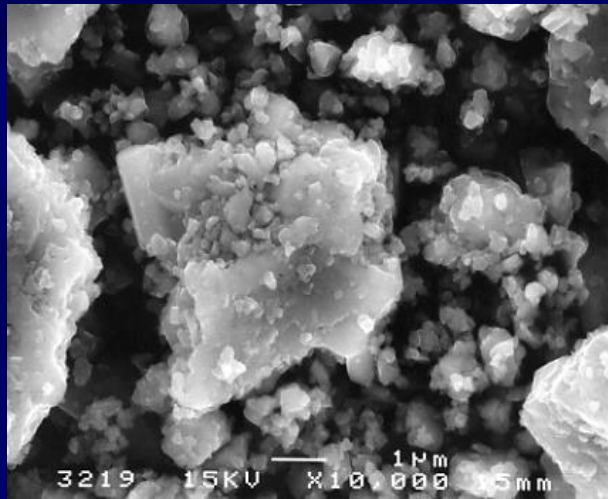
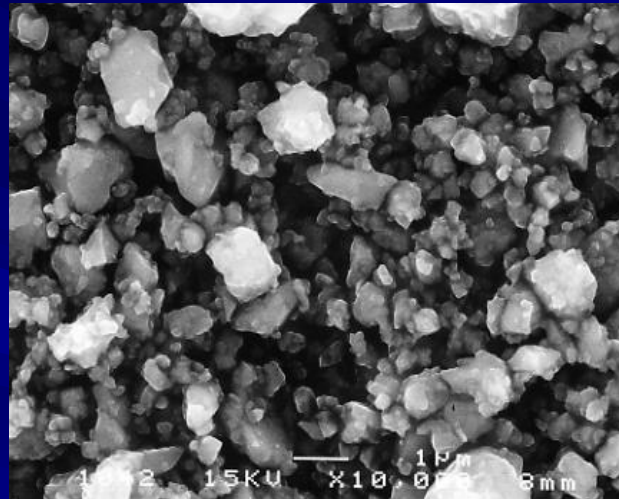
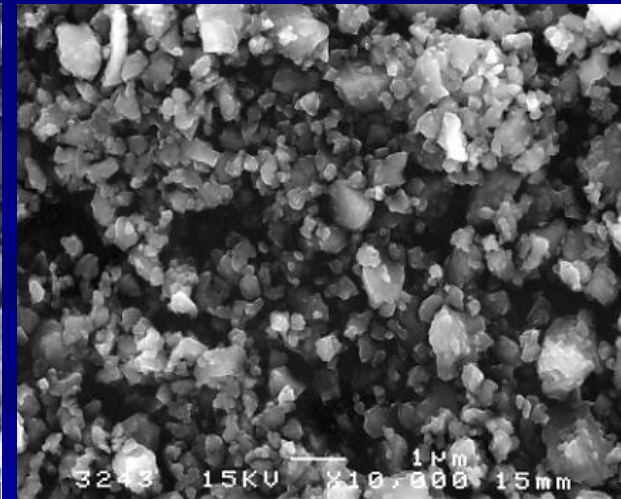
** Specific Surface area : measured data by BET method

◇ Particle Distribution

(Typical Data)



◇ SEM Image

SN-9**SN-9S****SN-9FWS**

Morphology is crush shape derived from brake-down process.

◇ Process

