

Continuous Powder absorbing, dissolving & dispersion device

JET PASTER®

Optimum application especially for Lithium Ion Battery,
Cellulose Nano Fiber processing



「JET PASTER®」 exceeds conventional wisdom in
dispersion & dissolving

**Powder absorbing, mixing & dispersion
can be done in extremely high speed**

「JET PASTER® will dramatically change former processing style」



Cavitation effect

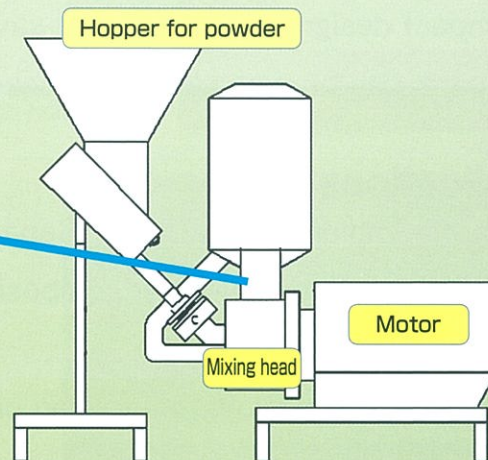
Applied new idea on JET PASTER®

High speed rotor will generate mechanical shear and cavitation.
Cavitation will contribute to disperse agglomerates by expansion and shrinkage of microbubbles

Microbubbles generated by cavitation (Took picture thru casing made by acrylic resin)



Making use of Microbubbles generated by cavitation



Dispersion mechanism by microbubbles generated by cavitation (Assumption)

Agglomerates

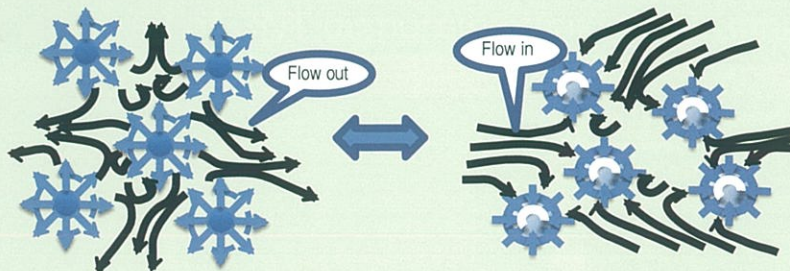


Generate cavitation bubbles
※ microbubbles generate
inside core of agglomerates

Cavitation
bubbles shrink

Cavitation
bubbles expand

**Agglomerates
will be dispersed**



Advantages of JET PASTER®

● Features

- Liquid, powders will be available for continuous supply, dissolving and dispersion
- Realize 5~6 times quicker in productivity compare to conventional mixers
- Realize to minimize process due to several kinds of powders can be fed in one time
- Compact design allows to space-saving
- All parts can be completely detached which maintains sanitary requirement

● Applications

- Battery : Lithium Ion Batteries, Capacitors, Fuel Cell, Binders
- Chemicals : High molecular composite, Toner, Coating agents
- CNF(Cellulose Nano Fiber)
- Cosmetics : Emulsion, Sun screen cream
- Medicine : Medical patch, Ointment

● General examples in capability for dispersion & dissolving

Powders	Powder feeding method	Capability (kg/h)	Density (%)	Slurry amount (kg/h)	Slurry viscosity (mPa · s)
Lib Cathode materials (Li Metal oxide)	Hopper + Powder feeding device	~ 300	50 ~ 70	300 ~ 600	1000 ~ 10000
Lib anode materials (Carbon etc.)	Hopper + Powder feeding device	~ 300	40 ~ 50	600 ~ 750	1000 ~ 10000
Activated carbon	Hopper + Powder feeding device	~ 100	25 ~ 35	250 ~ 400	1000 ~ 10000
PVDF	Hopper + Powder feeding device	~ 50	~ 12	~ 400	~ 1000
CMC	Hopper + Powder feeding device	~ 10	1 ~ 2	500 ~ 1000	1000 ~ 5000
CNF+Inorganics	Hopper + Powder feeding device	~ 20	10	200	~ 10000

Advantages of JET PASTER[®]

Realize highly graded electrode slurry

● Homogeneous dispersion

The smaller active materials for electrode, more difficult to disperse on conventional mixers. However, it is available to disperse in quite high speed on our JET PASTER[®] by the reason of our unique mechanism

(Dispersion samples of active materials for capacitor)

Conventional mixer

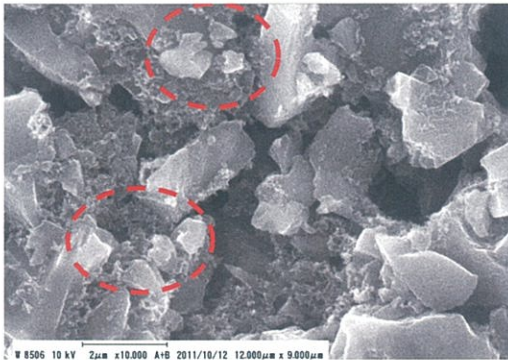
JET PASTER[®]

- Particle damage may occur
- Insufficient dispersion of conductive additives

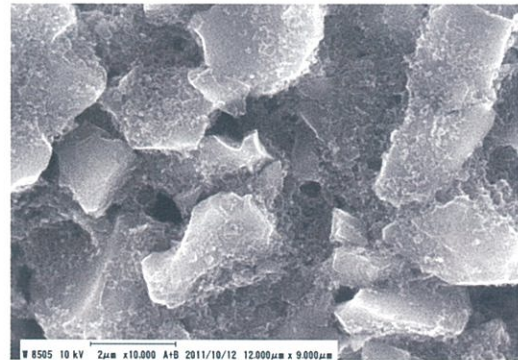
soft and well-dispersion
by cavitation bubbles

- No particle damages
- Homogeneous dispersion of Conductive additives

(×10,000)



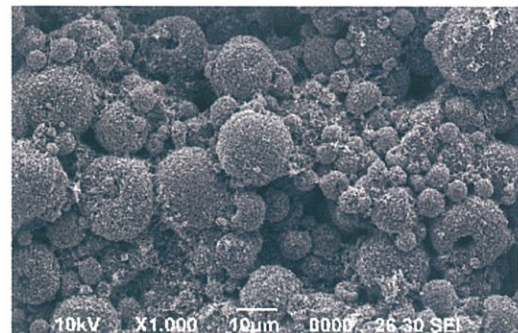
(×10,000)



● Mixing capability without particle damages

Unique mechanism of JET PASTER[®] enables to disperse without damage on active materials such as LFP (right picture)

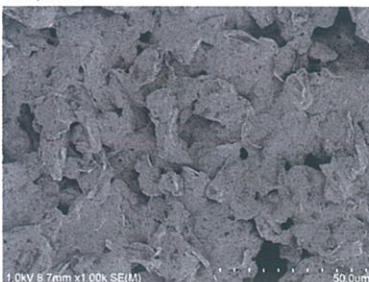
(×1,000)



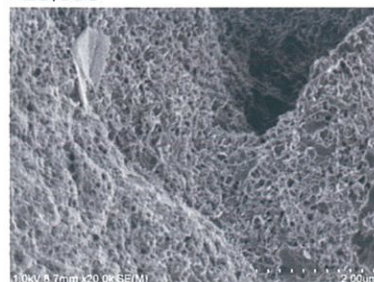
- No damages on surface of particle

Pictures of CNT dispersion view on Graphite

×1,000



×20,000



CNT

PROPERTIES	UNITS
Average Diameter	11 nm
Average Length	10 μ m
Surface Area (BET)	>200 m ² /g
Tap Density	0.03-0.15 g/cm ³

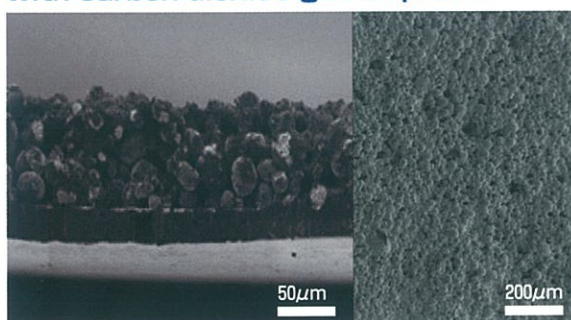
We have troubleshooted and simplified a process for creating next-generation positive-electrode material; utilizing carbon dioxide gas and the cavitation effect.

Neutralization reaction
by carbon dioxide gas



Easily neutralized
using the cavitation effect on JET PASTER

With carbon dioxide gas at pH7.9



Cross section

Surface

NCA:CB: Acrylic binder =92:4:4 (wt.%)

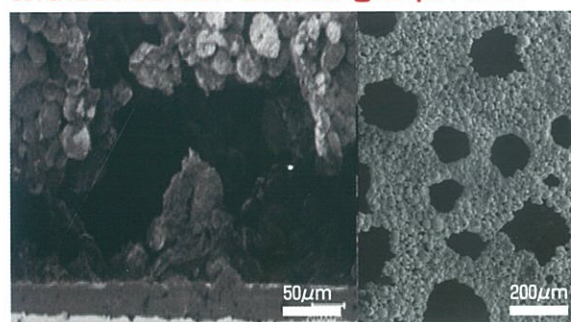


Carbon dioxide gas

Model : JPSS-X



Without carbon dioxide gas pH12.3



Cross section

Surface

Hydrogen is generated due to the following reaction, which becomes porous:
 $2\text{Al} + 2\text{LiOH} + 6\text{H}_2\text{O} \rightarrow 2\text{Li}[\text{Al}(\text{OH})_4] + 3\text{H}_2 \uparrow$

Dispersion stability of Inorganic composite available by CNF

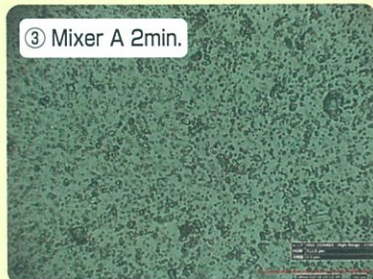
① JET PASTER 2min.



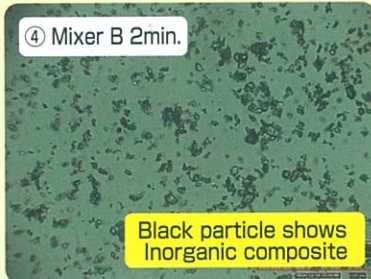
② JET PASTER 8min.



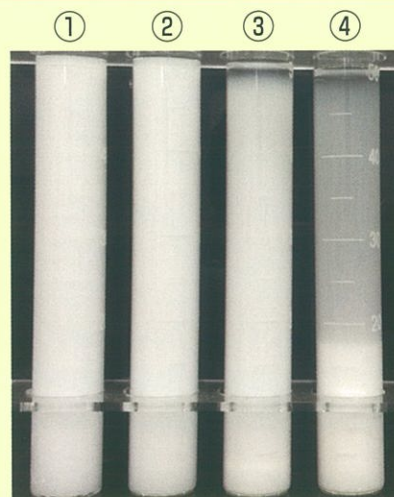
③ Mixer A 2min.



④ Mixer B 2min.



Black particle shows
Inorganic composite



Powder sink status after one week

Test	Mixer	Rotor rev.	Mixing time
①	JPSS	6000rpm	2 min.
②	JPSS	6000rpm	8 min.
③	A	6000rpm	2 min.
④	B	1000rpm	2 min.

• Scale : 3L

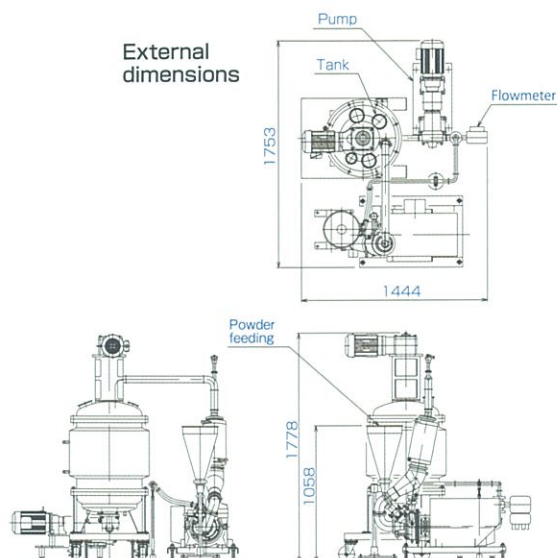
Result

JPSS proves good
dispersion stability in
only 2minutes mixing

Series of our product

● JP-L

External dimensions



■ Realize high productivity due to high speed dispersion

JPL provides high productivity by high shear and homogeneous energy
Applicable for production scale



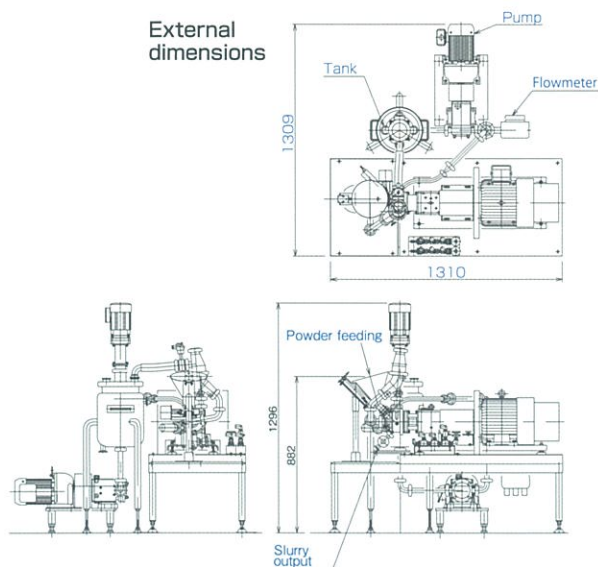
● JP-S



■ For laboratory development~small lot pilot line

Applicable for production scale
Scale available for 0.5L ~ 1.0L ~ 20L

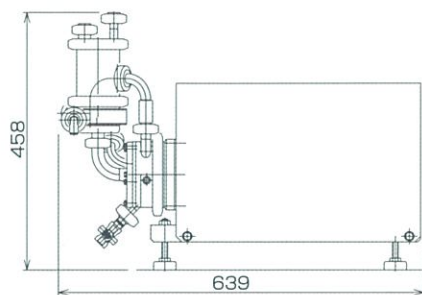
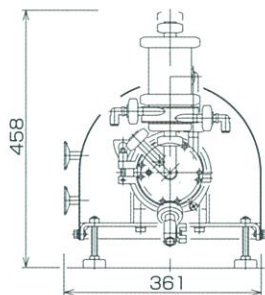
External dimensions



	JP-SS	JP-S	JP-L
Power source	AC200V 50/60Hz 3-phase	AC200V 50/60Hz 3-phase	AC200V 50/60Hz 3-phase
Motor	5.5kw	5.5kw	18.5kw
Materials contact slurry	SUS304	SUS304	SUS304
Application	Lab purpose	Lab purpose	Pilot purpose
	For R & D	Small quantity pilot line	Production line
Minimum applicable volume	0.5L~1.0L	3L~20L	40L~

JPSS-X for Laboratory purpose

Ever evolving「JET PASTER」



General information

- **Space requirement 70% less** than JPSS which is smallest formerly
- Applicable amount of material will be **150cc ~ 300cc**
- Cooling jacket is standard spec

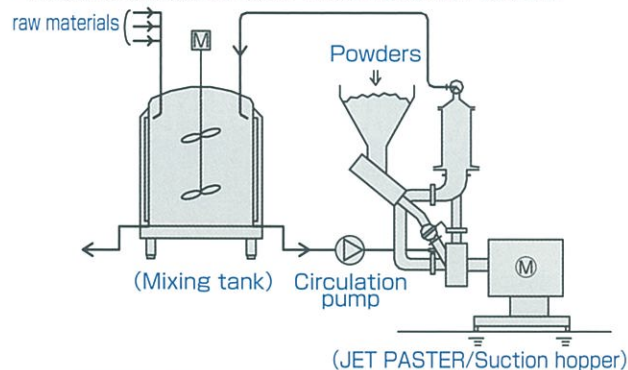
Tabletop JET PASTER JPSS-X specification

Power	2.2kW
Power source	AC200V 3-phase
Available amount	150~300cc
Material contact slurry	SUS304
Rotor rev.	2400~7200rpm

System integration

● Circulation system

- *For deep dissolving, high dispersion case
- *Recommendable for batch amount less than 500L/B



● Techno-stage

[communication]

We think our Techno-stage is as a communication space with our customers.

In our Techno-stage prepares all our series of product from JPSS-X thru JPL for our customer trials

Besides, in order to evaluate the result of trials we prepare several kind of testing equipment such as

Rheometer, Viscometer, Grind gauge, Water content meter etc.

[consulting]

[R&D]

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