Material for Conductive paste
Low molecular weight dispersant
ESLEAM® 221P

2025.8 (Ver.3)
NOF CORPORATION

1 ESLEAM® 221P

ESLEAM® 221P is the acidic dispersant with low molecular weight. It is suitable for dispersing metal powders (< 1μm), that shows prevention of aggregation and viscosity reduction in the dispersing system.

2 Features

- Shows excellent dispersing property for metals, especially for Nickel, prevents metal powders from aggregation and lowers viscosity in dispersing system.
- High active content (100%), it does not contain impurities such as alkali metals.
- Shows excellent solubility in various solvents except for water.
- Shows good thermal decomposition property.
  It decomposes at 500℃ in Nitrogen atmosphere.

3 Properties

Item	Value or Property
Active content(%)	100
Appearance	Yellow liquid
Nature of Liquid	Acidity
Viscosity(mPa•s,25℃)	Approximately 1,700

* Representative values, not values of standard.

4 Solubility

Solvent	Solubility
Water	×
Ethanol	○
Terpineol	○
Acetone	△
Hexane	○
Toluene	○

* ○:soluble △:emulsification ×:insoluble
（5wt% Solution, at 25℃）

5 Additive amount

The additive amount of ESLEAM® 221P is normally from 1 to 5wt%（for powder weight）. As the optimal additive amount strongly depends on particle size or surface area of powder. We recommend some tests using different amount of the product to determine the optimal additive amount.

6 Regulatory information

Country	Status *1
ENCS (Japan)	✓
TSCA (US)	✓
IECSC (China)	✓
ECL (Korea)	✓ *2
TSCI (Taiwan)	✓ *2

*1 ✓:On list, —:Not on list. Please ask us regarding the registration status of REACH for each product.

*2 Please contact our sales representative for declaration or registration depending on quantity.

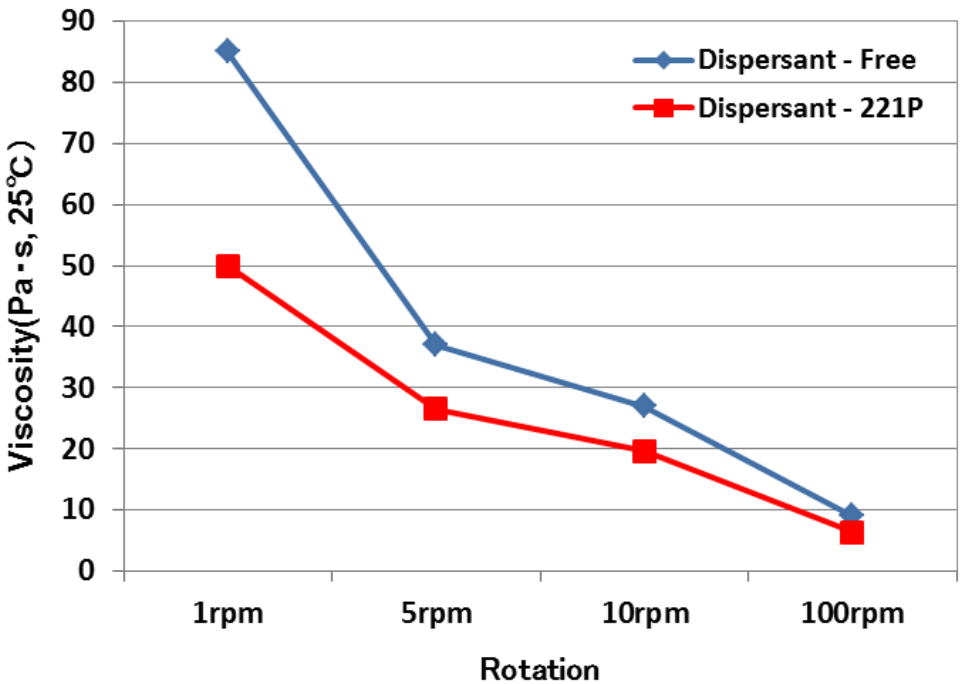
7 Evaluation of Nickel Paste

○Ni Paste formulation

	Product name ／Chemical name	Concentration (wt%)	Remarks
Dispersant	ESLEAM® 221P	1.012	2wt% for amount of Ni and additive
Metal Powder	Nickel	46	–
Additive	Barium Titanate (BT-01)	4.6	10wt% for amount of Ni
Resin (Binder Conc.; 8wt%)	Vehicle	28.75	2.3wt% as binder conc. (Ethyl Cellulose)
Solvent	Dihydroterpineol Acetate (DHTA)	Balance	–

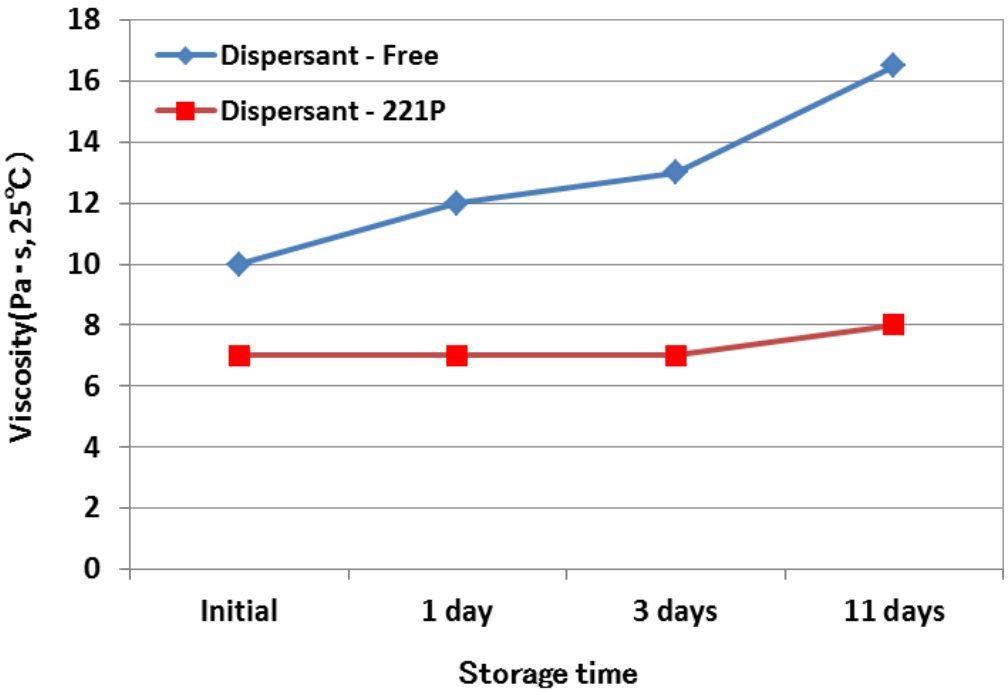
○The Effect of Viscosity Reduction in Nickel Paste

Dispersant	Viscosity(Pa•s)				Viscosity Ratio (10rpm/100rpm)
	1rpm	5rpm	10rpm	100rpm	
Dispersant Free	85.0	37.0	27.0	9.0	2.9
ESLEAM® 221P (2wt% for pigment)	50.0	26.5	19.6	6.4	3.1



ESLEAM® 221P gives moderate thixotropy and viscosity reduction

○The Stability of Viscosity in Nickel Paste



ESLEAM® 221P stabilizes the viscosity

○The Stability of Homogeneity in Nickel Paste（after 24 hours）



Dispersant Free

Separation



ESLEAM® 221P
（1.2 wt%）

Consistent



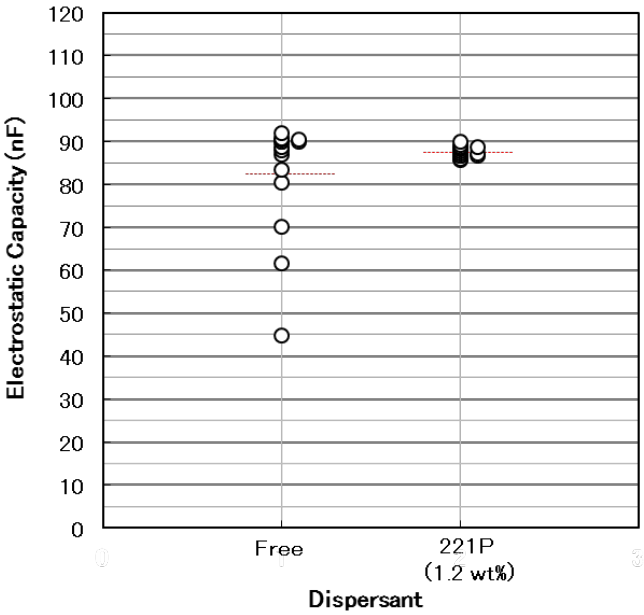
ESLEAM® 221P
（2.0 wt%）

Consistent

ESLEAM® 221P shows excellent dispersion stability

8 Evaluation for MLCC（Multi-Layer Ceramic Capacitors）

○Electrostatic Capacity for MLCC



【Composition of Ni Paste】

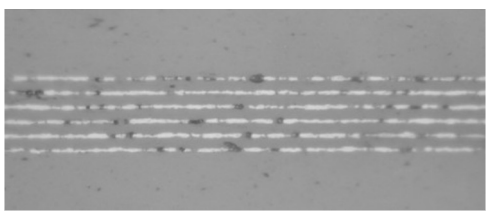
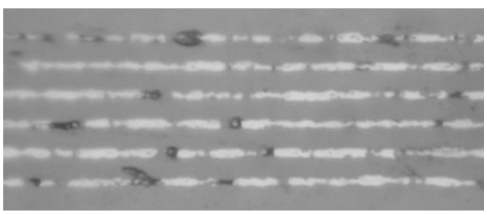
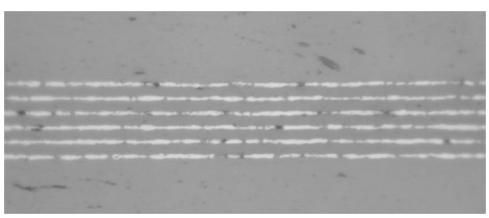
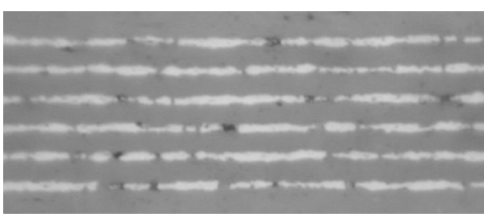
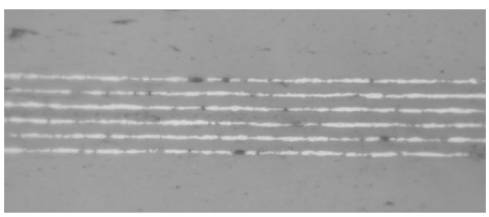
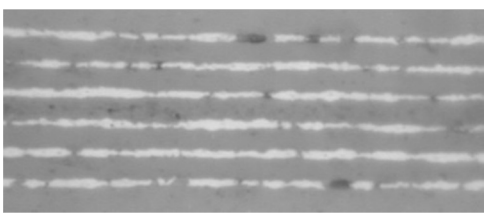
Run	Dispersant	Ni Concentration
1	Dispersant Free	36.8 wt%
2	221P（1.2 wt% for Ni）	37.0 wt%

【Characteristics of MLCC】

Run	Ni Deposition Amount	Electrostatic Capacity (Ave.)	Variability (Ave./3σ)
1	3.4 mg/cm^2	82.5nF	49.1%
2	3.5 mg/cm^2	87.5nF	4.5%

ESLEAM® 221P reduces variability in electrostatic capacity

○Cross Section Image of MLCC

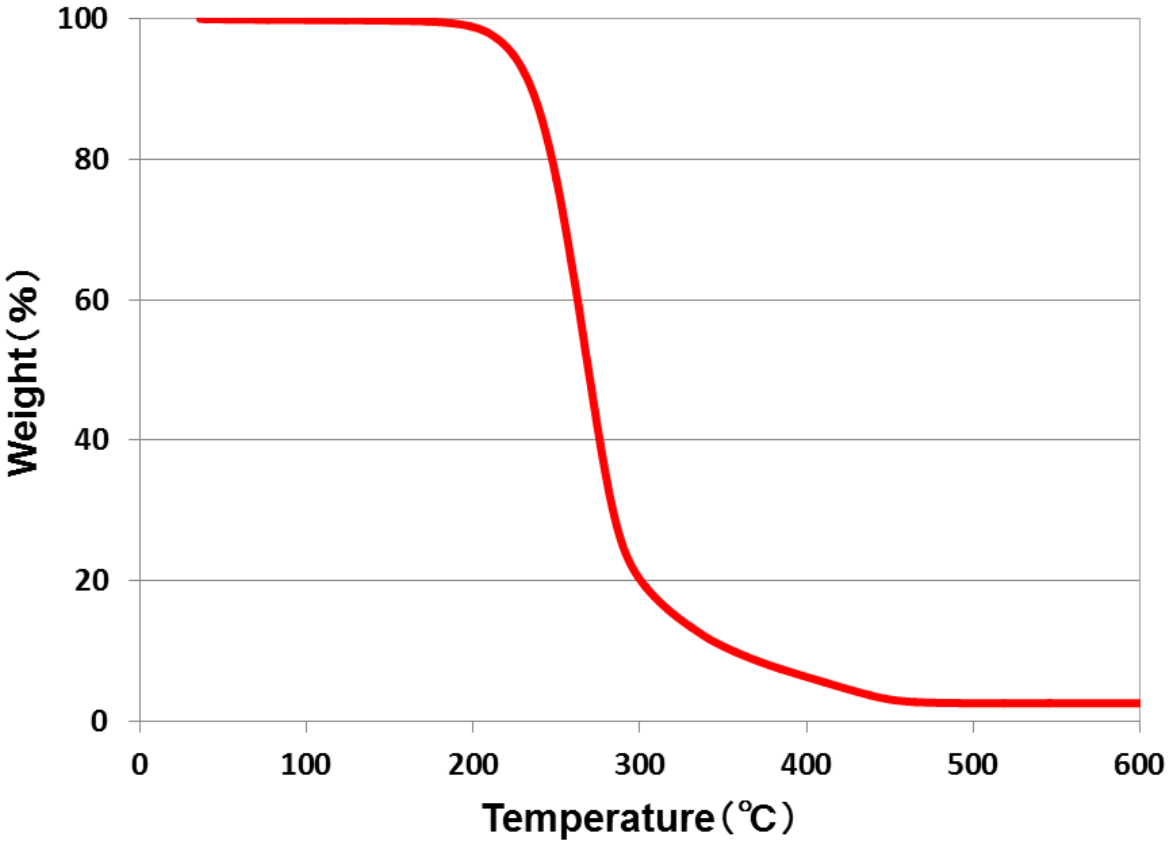
Dispersant in Ni Paste	Cross Section Image (1) 10um	Cross Section Image (2) 10um
Dispersant Free (Ni Deposition Amount : 0.34mg/cm^2)		
221P / 1.2 wt% (Ni Deposition Amount : 0.35mg/cm^2)		
221P / 2.0 wt% (Ni Deposition Amount : 0.34mg/cm^2)		

ESLEAM® 221P gives excellent continuity in nickel electrode layers

9 Thermal decomposition properties

ESLEAM® 221P shows good thermal decomposition property.
It decomposes at 500℃ in Nitrogen atmosphere.

N_2 flow rate：75ml/min.
Heating rate：10℃/min.



10 Caution on handling

For more detail, please refer to Safety Data Sheet (SDS).

11 Other Information

This leaflet has been published based on the best effort in NOF CORPORATION's research, however, the evaluation result mentioned in this leaflet can not be assured. And it is necessary to handle this material carefully since all chemicals may have unknown hazardous properties. Please arrange the safe condition of use in the responsibility of each user. And if this material is used in the specific condition, please prepare for the safety measure which is suitable for the application, then use this material.

Please refer to our sales representative for any other questions.

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