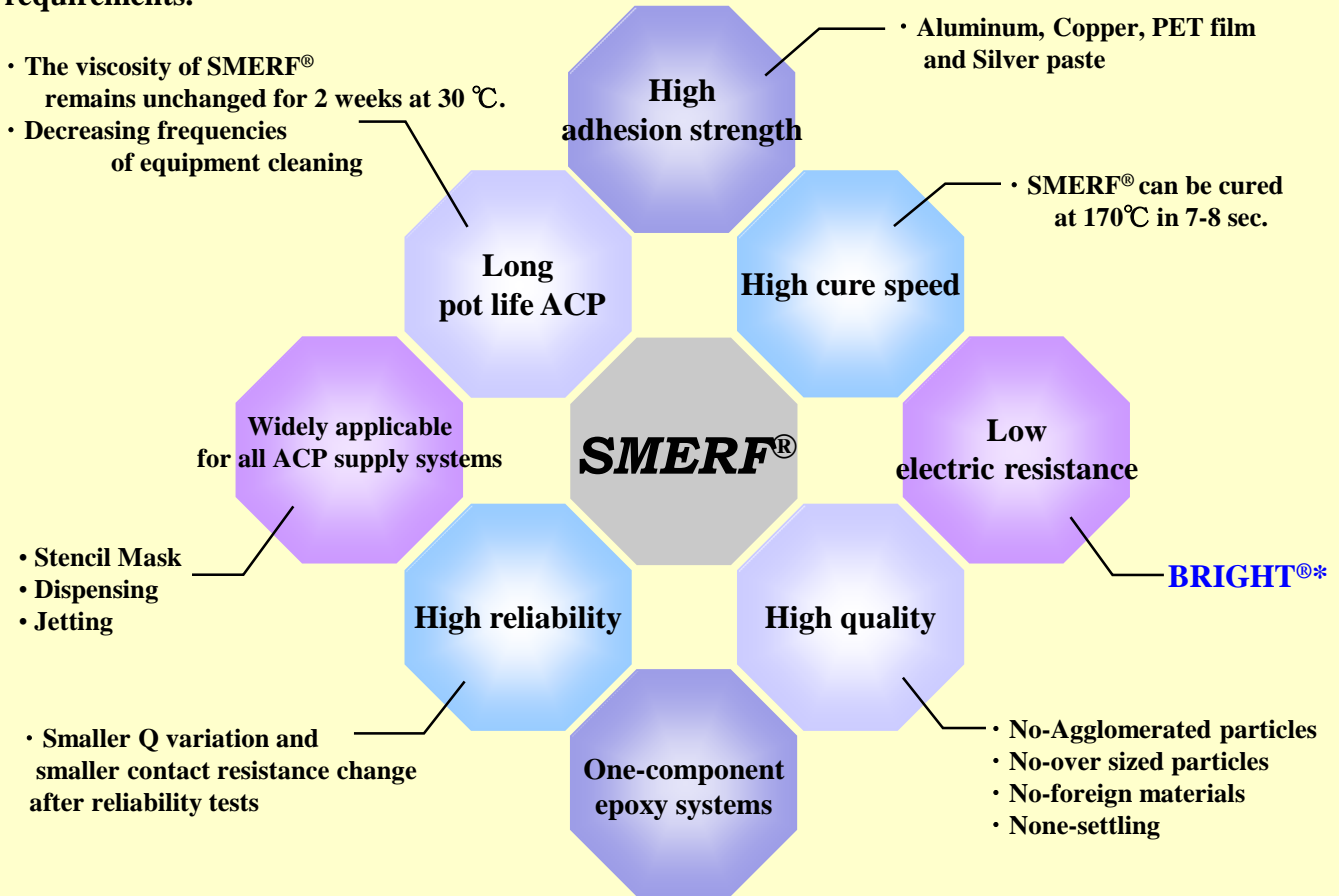


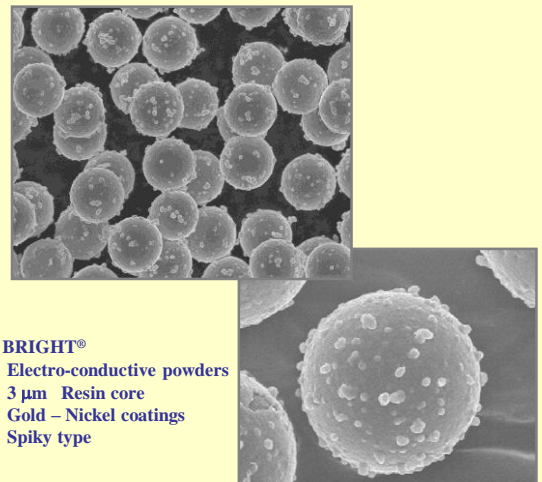
Features of SMERF®

SMERF® is a series of excellent ACP's using metal coated powders which are produced by Nippon Chemical Industrial Co., Ltd. (BRIGHT®*). Superior SMERF® products can be customized to meet specific application and customer requirements.



* **BRIGHT®** Electro-conductive powders

BRIGHT® products are a series of hybrid electro-conductive powders which are produced by coating high-quality metals on its cores. The technology, an advanced electroless nickel / gold plating process has been invented and developed by Nippon Chemical Industrial Co., Ltd. The unique BRIGHT® electro-conductive powders are made by coating single or double layers of metal, (or metals) onto a variety of substrates such as high performance resin particles, metal particles, etc. The materials can be customized to meet the requirement of specific applications.



BRIGHT®
Electro-conductive powders
3 µm Resin core
Gold - Nickel coatings
Spiky type

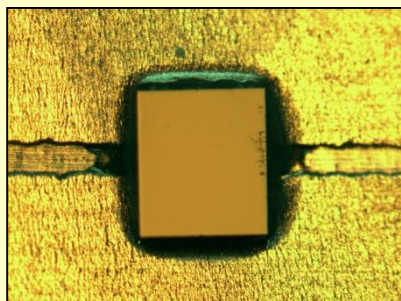
Typical SMERF[®] properties

SMERF [®]		RL0404 (Standard)	RL0407 (Standard)	RL0504 (High reliability)	RL0507 (High reliability)
Application		Dispensing, Jetting			
Electro-conductive particles Various types of powders can be selected from our standard and customized grades.	Core	Benzoguanamine	Benzoguanamine	Trade secret	Trade secret
	Coating(s)	Nickel / Gold	Nickel / Gold	Nickel / Gold	Nickel / Gold
	Particle size	3 μm	3 μm	3 μm	3 μm
Viscosity (Rheometer)	1[1/s]	25 Pa·s	40 Pa·s	25 Pa·s	40 Pa·s
Thixotropic Index (Rheometer)	1[1/s] / 10[1/s]	2.7	2.2	2.7	2.2
Gel time	150 °C	20 sec.	20 sec.	20 sec.	20 sec.
Tg (DSC)		114 °C	125 °C	114 °C	125 °C
Young's modulus		2850 MPa	2990 MPa	2850 MPa	2990 MPa
Density		1.2 g/m ³	1.2 g/m ³	1.2 g/m ³	1.2 g/m ³
Water adsorption	Boiling water for 2 hrs.	0.4 %	0.4 %	0.4 %	0.4 %
Pot Life	at 25 °C	10 days	10 days	10 days	10 days
	at 0 °C	6 months	6 months	6 months	6 months
Bonding Condition Please determine bonding conditions by preliminary testing	180 °C /180 °C	6-7 sec.	6-7 sec.	6-7 sec.	6-7 sec.
	170 °C /170 °C	7-8 sec.	7-8 sec.	7-8 sec.	7-8 sec.
	160 °C /160 °C	10 sec.	10 sec.	10 sec.	10 sec.

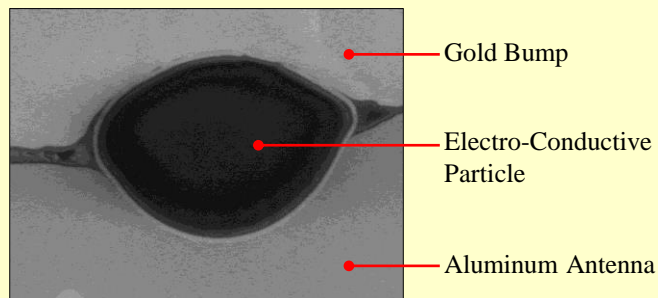
Performance of SMERF[®]

Appearance of Fillet

IC : I-CODE SLI Antenna : Aluminum
 ACP : RL0407 (Gold coated resin particle)
 Bonding Condition : 170 °C/170 °C, 2.5N, 10sec.



Cross Section of Electro - Conductive Particle



- The high reliability in various type of tags, such as for HF or for UHF
- The good adhesion and the high reliability in various materials of antenna, Copper, Aluminum and Silver Paste
- The little variation of the Q value after the reliability test (PCT 121 °C/ 100%RH / 2atm /10 hours, THT 85 °C/ 85%RH / 168 hours, TCT 85 °C ~ -40 °C / 500 cycles) in the HF antenna

 **NIPPON CHEMICAL INDUSTRIAL CO., LTD.**

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