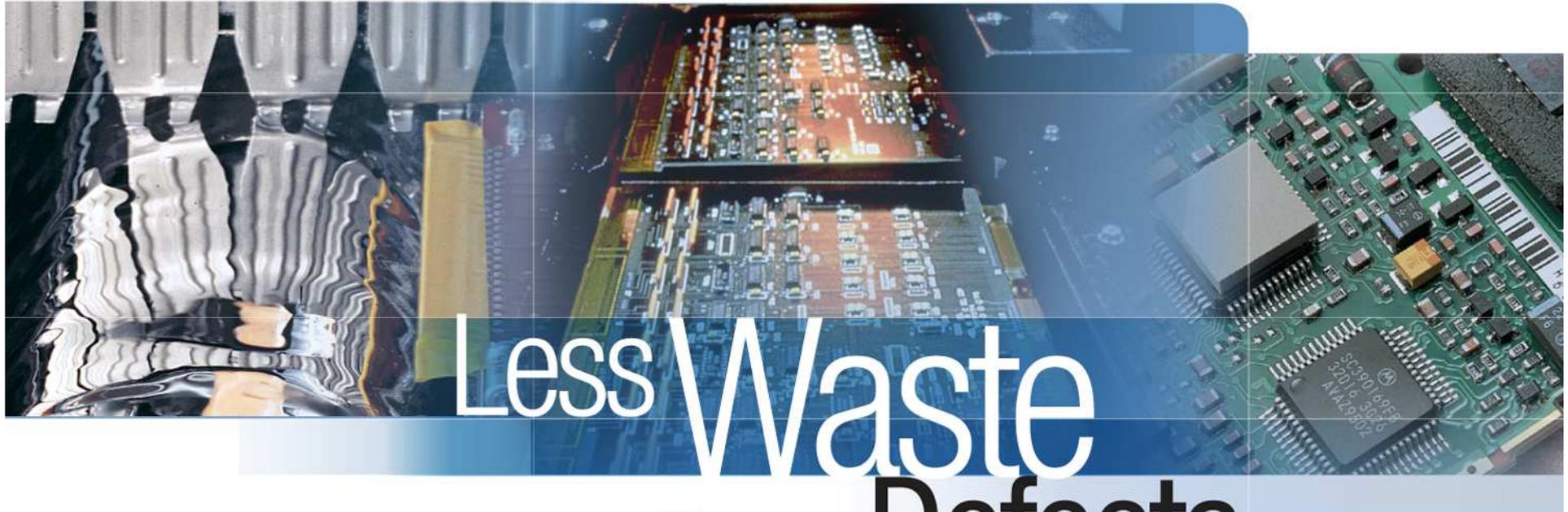


3M™ Novec™ Fluorosurfactant FC-4430
For Use in Lead-Free Soldering



Less Waste
Fewer Defects



Main Difference between Lead and Lead-Free Solder SMT Process



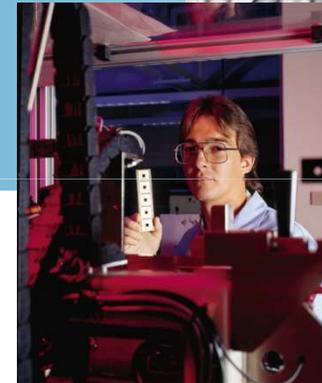
- Solder physical properties, melting point, oxidation
- **Higher peak temperatures (HCs and Silicones Unstable)**
- **Higher preheat temperatures (HCs and Silicones Unstable)**
- Lead-free finishes for boards and components (legally required)
- Solder cosmetics and surface effects
- **Solderability differences such as speed of wetting and spread**
- Less self-centering or alignment of components

Better solder flux is needed to overcome the high temperature and poor wetting

Typical Defects Associated with Lead-Free Reflow Soldering

- **Bridging**
- **Poor wetting**
- **Voids**
- **De-wetting**

Novec FC-4430 can help reduce these defects!



What Soldering Flux Does in SMT:

- Improve heat transfer
- Prevent oxidation
- Reduce joint stresses
- Lower surface tension (wetting)
- Reduce surface contaminations
- Easy to clean after soldering
- Minimize oxidative corrosion
- Reduce “cold solder joint”

Why Novec FC-4430
in soldering flux?



Soldering Flux Compositions

- Solvent – Ethanol or IPA
- Activation agent – Organic acids or salts
- **Surfactant – HC or FC surfactants**
- Film forming – Acrylic or phenolic resins
- Others

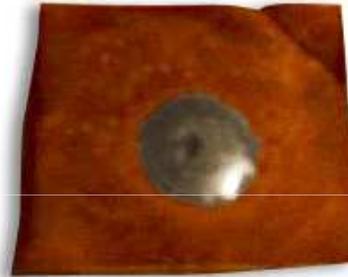


Why a Surfactant Is Needed

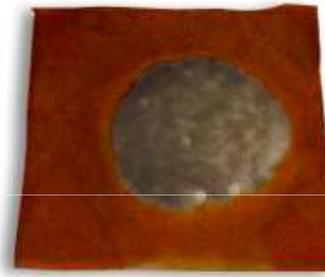
How to evaluate the performance of a surfactant in soldering flux – wetting and leveling



Poor wetting



Good wetting and spread
(500 ppm FC-4430)



Too much spread
and oxidation

- Reduce surface contamination, reduce corrosion
- Better insulation

Novec FC-4430 in Soldering Flux



- Excellent in reducing surface tension
- Fluorochemical bond – Very stable, high thermal stability > 200°C, ideal for lead-free solder
- Nonionic surfactant which reduces potential reaction and no ion migration, great surface property in solvent, surface tension ~20 dynes/cm in solvent
- Excellent viscosity range
- Does not change the pH of flux



Novec FC-4430 Typical Physical Properties

Static Surface Tensions in Organic Solvents/Systems

Solvent	Weight % Novec FC-4430			
	0.0	0.1	0.2	0.5
Distilled Water	72	23	21	20
Methyl Alcohol	23	23	23	23
Butyl Cellosolve	28	27	27	27
Butyl Carbitol	30	29	29	29
Methyl Ethyl Ketone	25	24	24	24
Toluene	28	28	28	28
Dimethylformamide	33	33	33	32
Polyethylene Triol LG-56	33	23	22	22
Cycloaliphatic Epoxy Resin	46	35	35	27
Epon™ Resin 828-RS	45	22	19	18

Thermal Stability

Temperature (°C)	FC-4430 Specified % Weight Loss					
	5%	10%	50%	80%	90%	95%
	195	255	305	330	355	405

Note: Data not for specification purposes.



Novec FC-4430 in Soldering Flux

FC-4430 significantly reduces oxidation

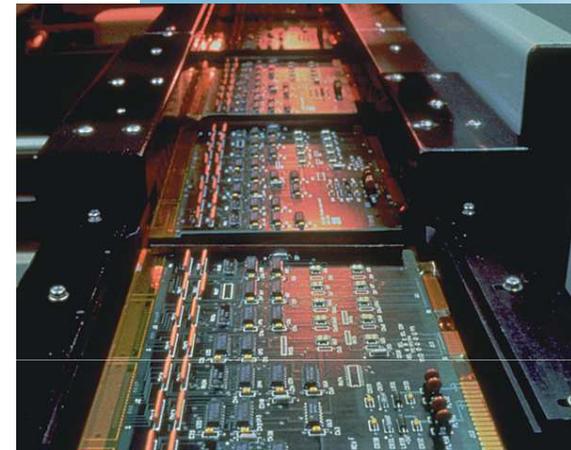
- Significantly less dross
- Easy to clean
- Significantly reduces defects

Low additive level 500-1600ppm

- Ethanol system (500ppm)
- Low residual, easy to clean after soldering

FC-4430 vs. HC and Silicon

- HC: Low thermal stability, bad for the lead-free soldering
- Silicone: High residual, difficult to clean after soldering
- FC-4430: High temp stable, better wetting and leveling





Soldering Paste

Soldering Paste

Composition

- ~90% metal solder powder
- ~10% solder flux (surfactant ~1000PPM)
- Surfactant content ~100ppm in total paste composition



Novec FC-4430 in Solder Paste



Solder paste performance improvement

- Lower the surface tension of the paste
- Improve the wetting and leveling
- Reduce the soldering residuals
- Reduce contamination
- Reduce cluster of oxidizing tin slag

