Mitsui thin Copper foil for Flex Application

	9μm	12μm	18μm
3EC(-M3)-VLP	○	○	○
DFF-V2M2	○	○	○
3EC-M3S-HTE	○(new)	○	○

Mitsui mining & smelting CO.,LTD.

Speicalty Foil Division

Mitsui Thin Copper Foil Line-ups

9micron Line-up		3EC(-M3)-VLP®	DFF®-V2M2	3EC-M3S-HTE(Super HTE®)
Schematic Diagram of Cross Section	Resist side / Lamination side			
Crystal structure (EBSP)		VLP	DFF	HTE
Feature		Very hard Handle easy	Soft and Low roughness for fine pitch	Low Stiffness High Folding-Endurance
Roughness Rz	Resist side	1.5 μ m	1.5 μ m	2.6 μ m
	Lamination side	3.5 μ m	2.0 μ m	2.5 μ m
· Handling performance		***Excellent***	Good	Good
· Circuit formation performance		Good	Good	Good
· Low stiffness		Moderate	Good	***Excellent***
· Bending endurance		—	Good	***Excellent***
· Chemical resistance		***Excellent***	***Excellent***	***Excellent***

	9 μ m	12 μ m	18 μ m
3EC(-M3)-VLP	○	○	○
DFF-V2M2	○	○	○
3EC-M3S-HTE	○(NEW)	○	○

Stable Supply

supported by Absolute Technology of Mass Production

Features of VLP® and Super HTE®

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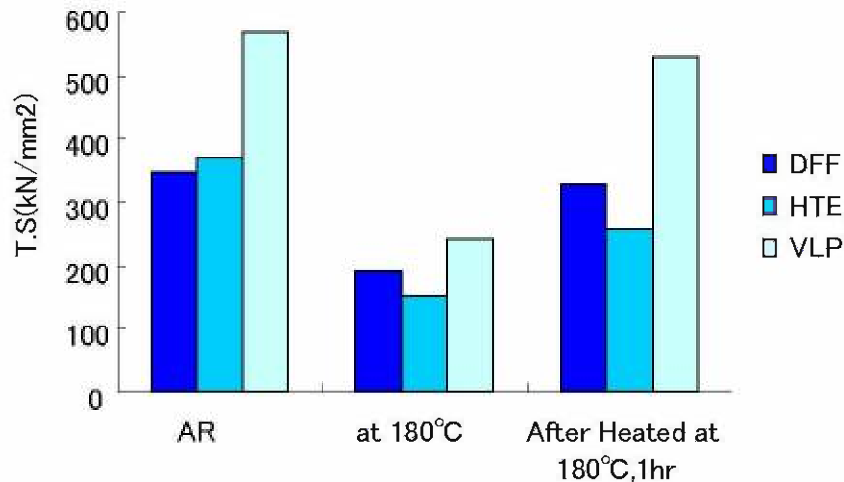
Easy Handling ! Mitsui VLP®

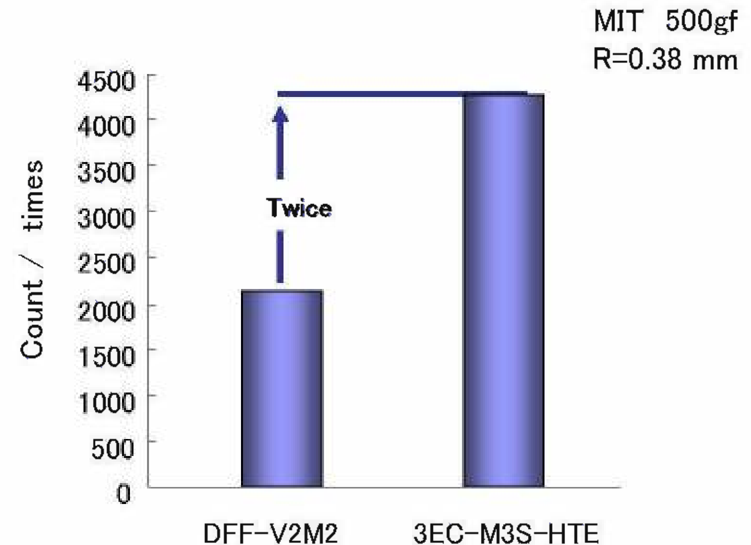
Tensile strength thickness 18μm



Mitsui VLP® has excellent handling performance
Best way to manufacturing Thinner FCCL/FPC

High Flexibility ! Mitsui Super HTE®

MIT folding (2FCCL 9micron foil)
(without coverfilm)



Mitsui Super HTE® has high performance of MIT folding
Super HTE® foil is twice the DFF® foil

Mitsui DFF® series for Fine circuit FPC

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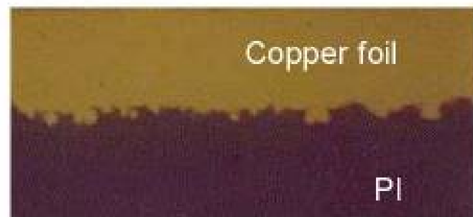
For High Density Circuit ! Mitsui DFF®-V2M2

Comparison of the circuit formation nature of 3EC-VLP and DFF-V2M2

Cross Section of surface profile

3EC-VLP®



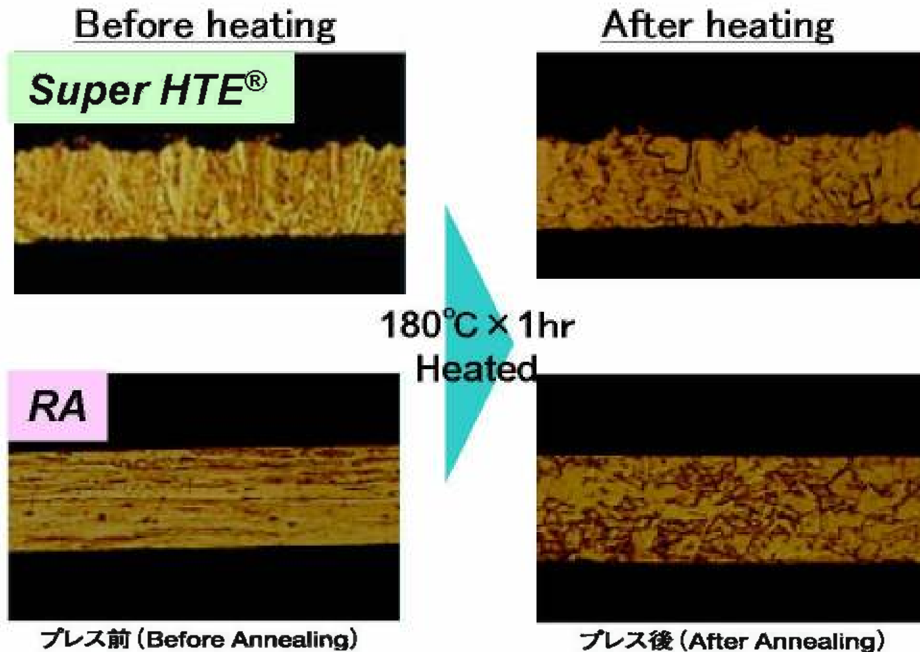
DFF®-V2M2

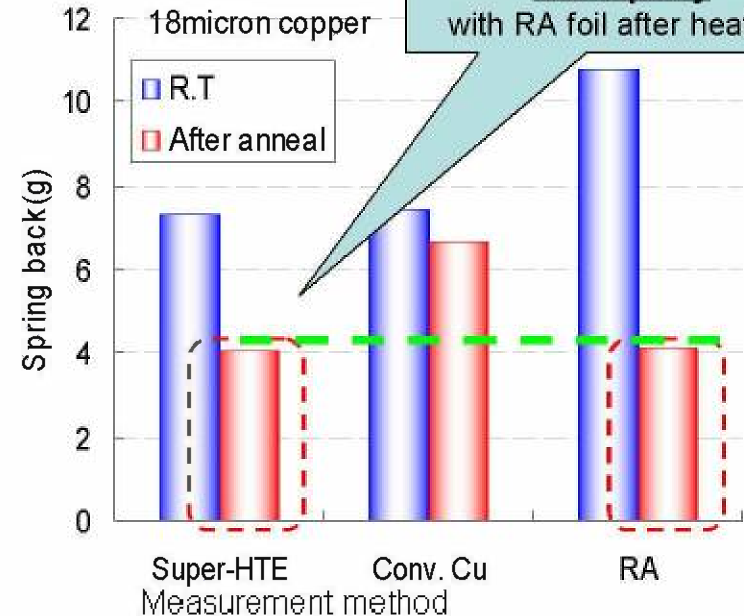
Extremely low profiled surface
Excellent Linearity !

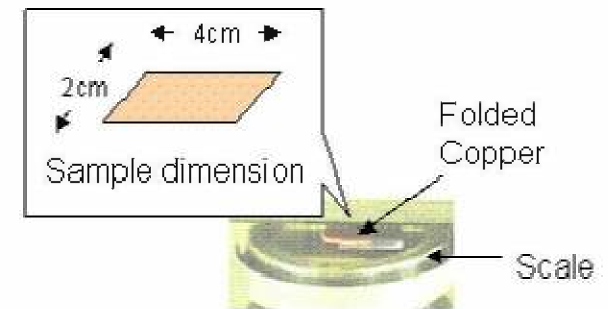
Line/Space=30/30micron (12micron copper with no plating)	
Wide area	Narrow area
3EC-VLP® 10kV X700 20µm 0542	10kV X1,400 10µm 0542
DFF®-V2M2 10kV X700 20µm 0542	10kV X1,400 10µm 0542

Mitsui Super HTE® series for Low Stiffness FPC

Mitsui Super HTE® has unique annealing property







Mitsui Super HTE® makes FPC stiffness lower because of unique annealing property

RA have to be replaced to Mitsui Super HTE® for its lower spring back force same as RA

Mitsui Super HTE® is very soft foil

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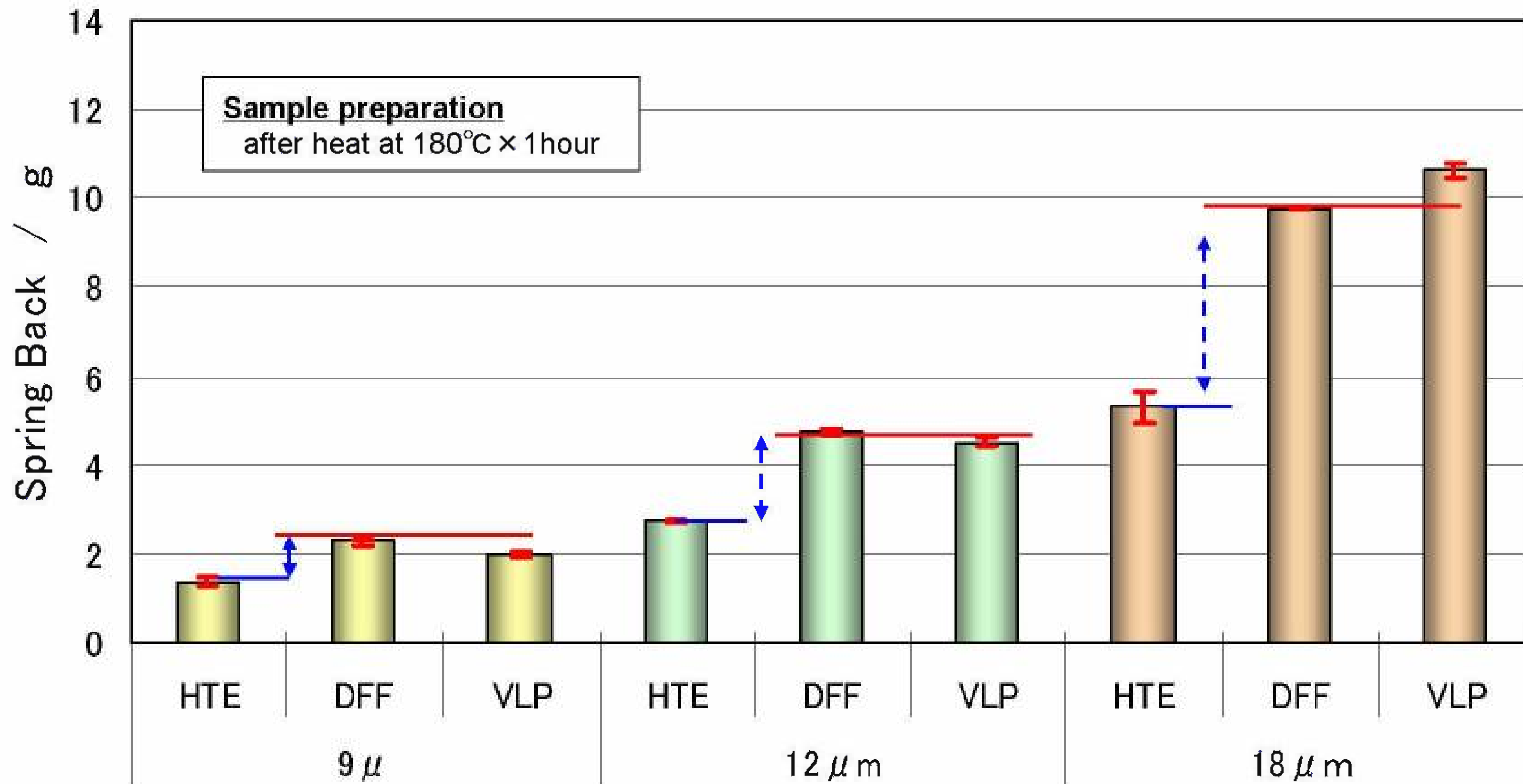
Spring-back force comparison of every thickness copper foil



Spring back force of Super HTE® is Remarkably Low !
Almost half of other ED foil

Flexibility -Copper foil-

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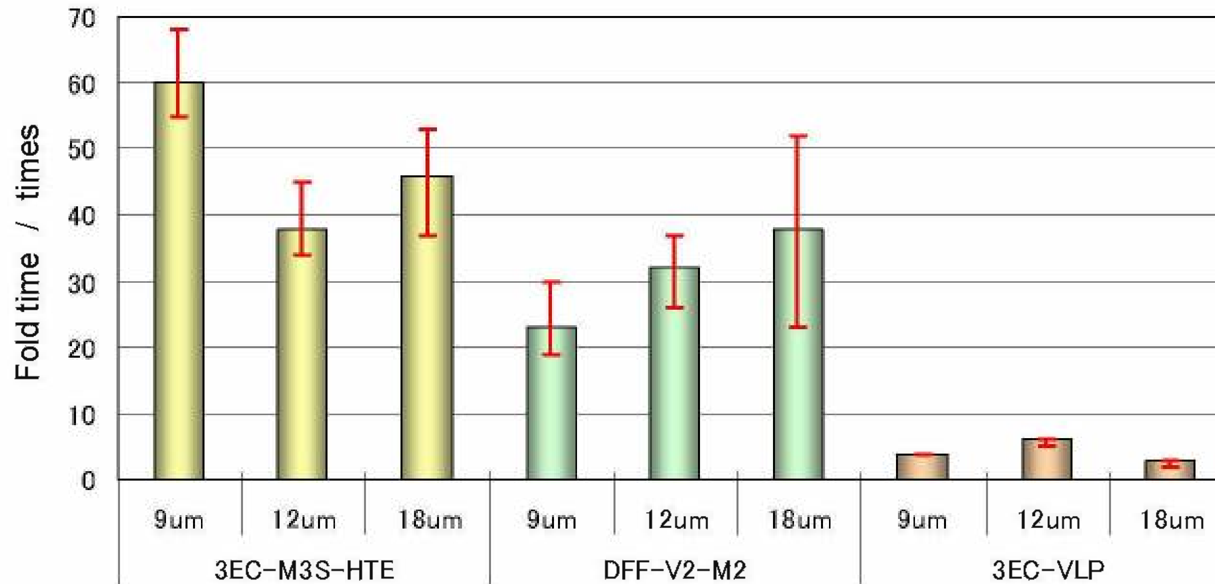
Result of folding test

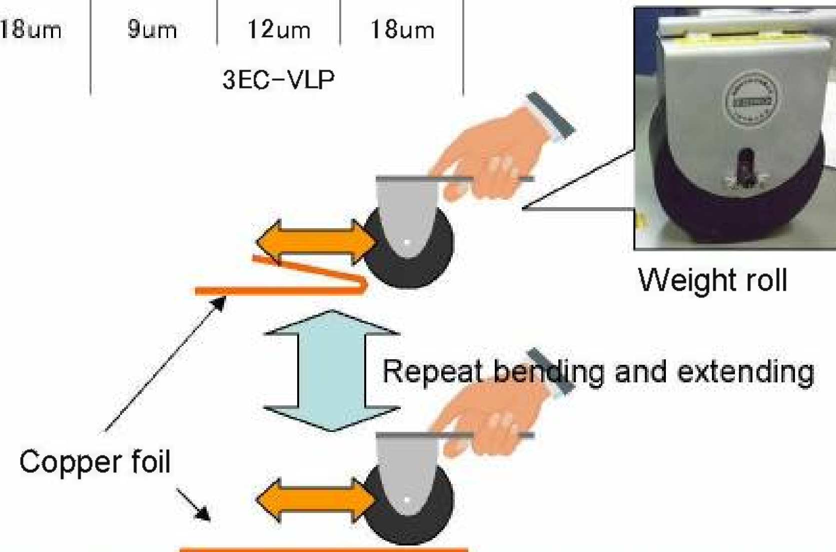
Frequently folding back and extending bare copper foil



Methods of folding test

Sample preparation
Heat-treat at 180℃ for 1hour
Trim the sample 1cm(wide) by 10cm(length)

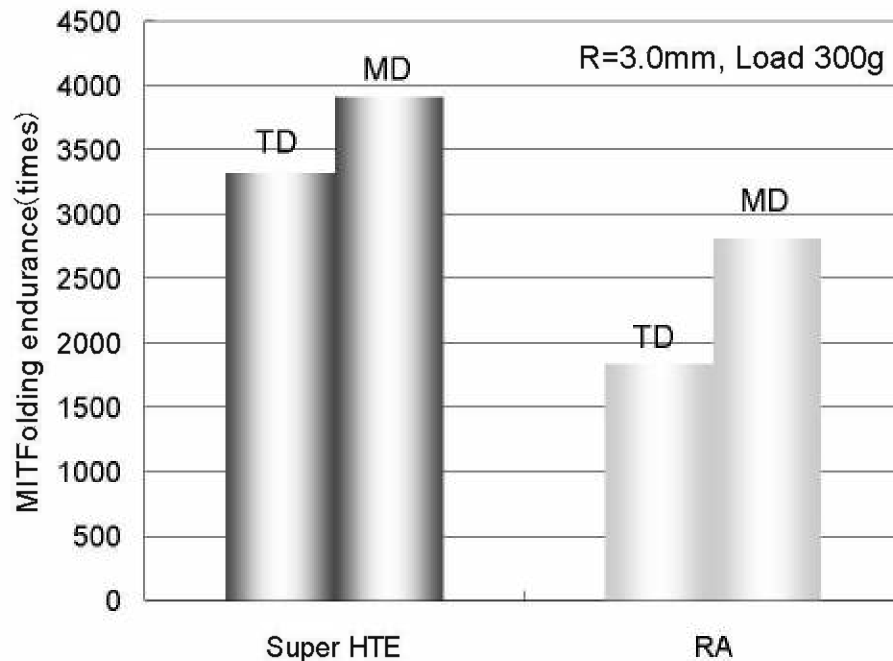
Test method (refer to the right figure)
Bend and extend the sample specimens frequently by weight roll
Count the folding times by the sample specimens fracture

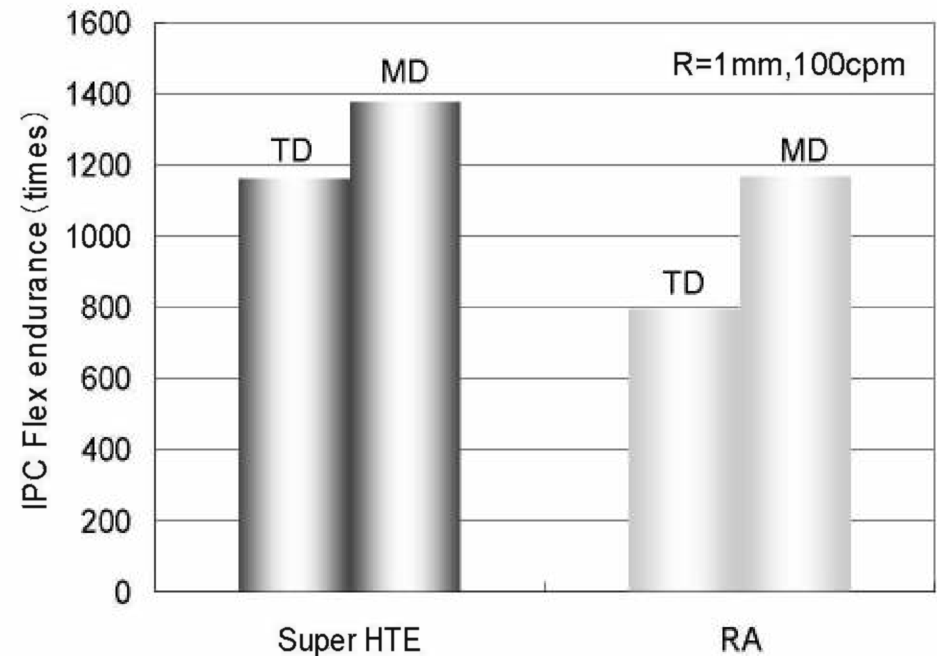


Flexibility -3FCCL- With no cover lay

Comparison with RA

FCCL that applied Mitsui Super HTE®, has much more Flexibility than RA
Suitable for Hinges of cell phone, OPU and etc





3layer FCCL(Substrate30 μ), No Cover lay, 18micron Cu

Flexibility -2FCCL- With no cover lay

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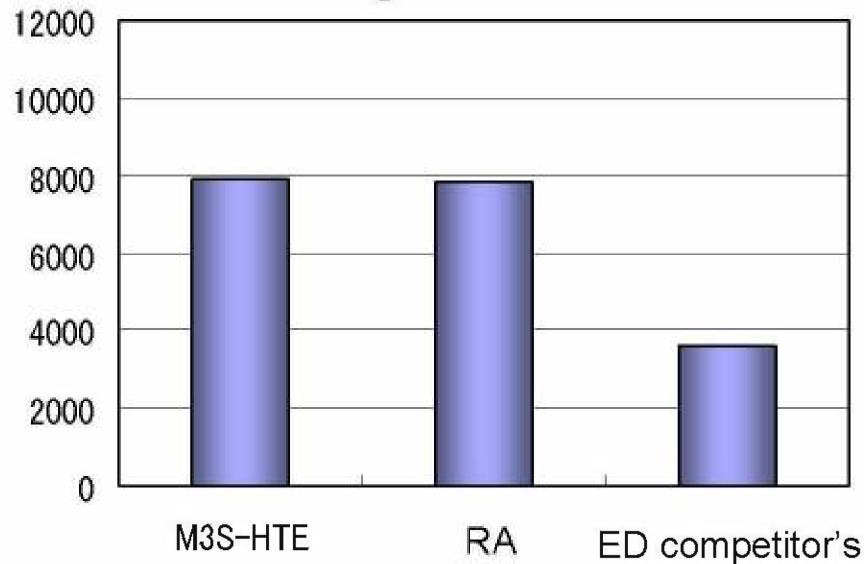
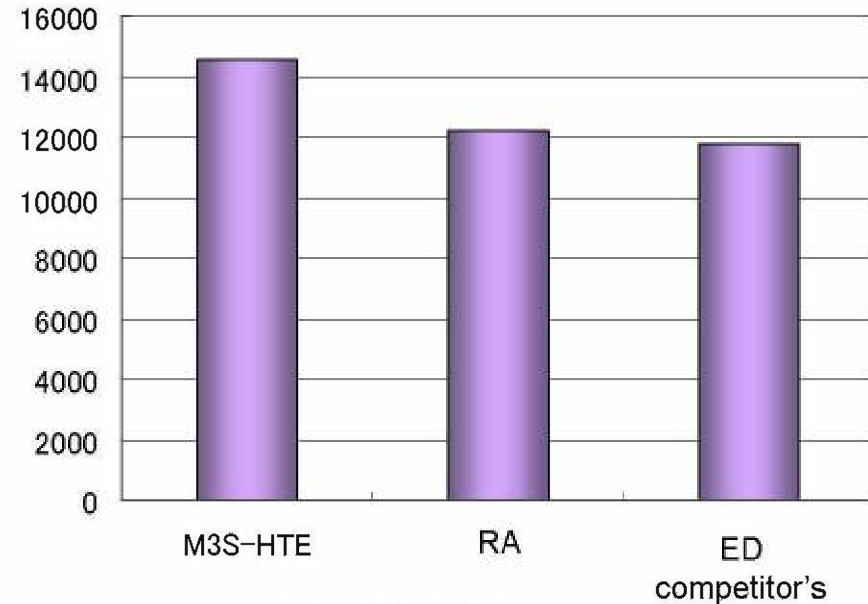
Comparison with RA and Competitor's ED





Measurement condition

Radius:	0.8mm
Load:	100g
Others:	Ambient with no cover lay

Measurement condition

Radius:	1.0mm (gap 2.0mm)
Others:	Ambient with no cover lay 100cpm Copper circuits out sided

2layer FCCL, No Cover lay, 12micron Cu

Evaluation result of folding endurance: M3S-HTE ≧ RA > ED competitor's

Mitsui's surface treatment advantages

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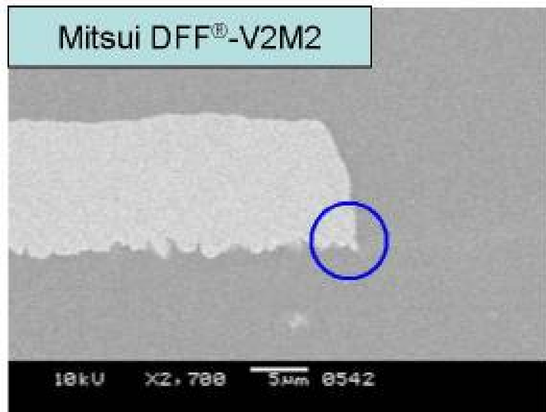
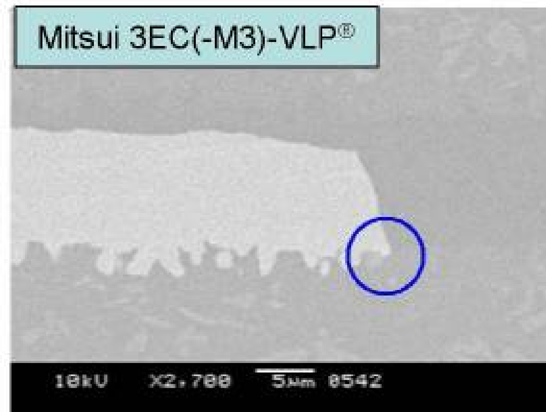
Cross sectional observation of circuit's edge

Chemical etching condition： CPE750 25%aq 30℃ 30sec dipping

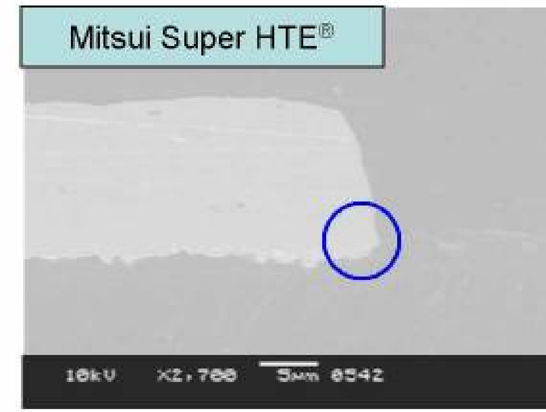
Mitsui DFF®-V2M2



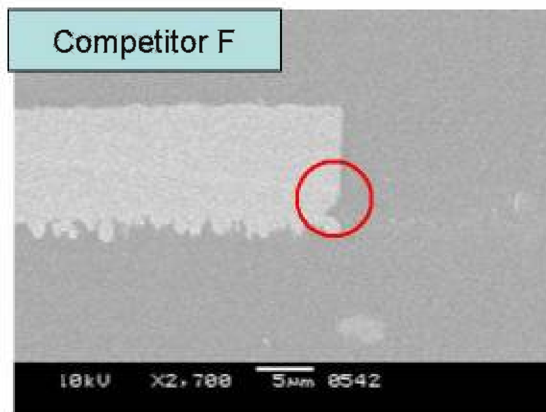
Mitsui 3EC(-M3)-VLP®



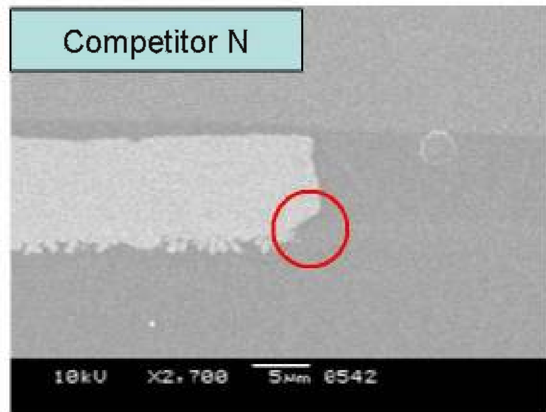
Mitsui Super HTE®



Competitor F



Competitor N



Surface treatment of Mitsui Copper Foil has excellent chemical resistance !

Mitsui Copper Foil is the best solution of fine circuit FPC