

## The Features of TPS method (our original surface treatment technology under a vacuum)

✓ It can be treated without contamination under a vacuum.

- ✓ It is not a surface modification. Because the roughness of film surface is not changed.
- TPS can be materialized over 10.0 [N/cm] adhesive strength between PTFE film and Copper of sputtering layer.

The comparison data of adhesive strength with TPS treated and untreated PTFE films by sputtering Copper.

X a method of measurement of Adhesive strength is by a peel test machine. XThe value of surface resistance before and after TPS means a change of film surface roughness.

PTFE film (thickness : $100 \mu$ m)		
	Adhesive strength $[N/cm]$ %1	Surface resistance of $Cu[\Omega/sq]$
Untreated PTFE + Cu	0.00	0.001
TPS treated PTFE+Cu	11.15	0.001

The condition of peel test An angle of peel=90° F=20N Width of test piece: 2mm Plating thickness: 25µ m Peel speed:0.5mm/min

SEM graph of TPS treated PTFE film surface



(X1)Adhesive strength value is converted into 1cm width. The surface resistance is measured by 4-terminal method.

## SEM graph of no treated PTFE film surface



## The following graph is a PTFE surface by existing treatment.



Adhesive strength can be improved by change the surface condition of existing method. But it means an increase the surface area. And the surface roughness deterioration brings about "Transmission Loss".

Because PTFE treated by existing method is unfit for high speed communication like 5G. The above SEM graphs prove that PTFE surface is not changed before and after the treatment by TPS. It is confirmed The existing method changed PTFE surface by left SEM graph.

(3 SEM graphs are same 1000 times magnification.)

Notes : All above values are the measurement values and they are not guaranteed performance.



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