



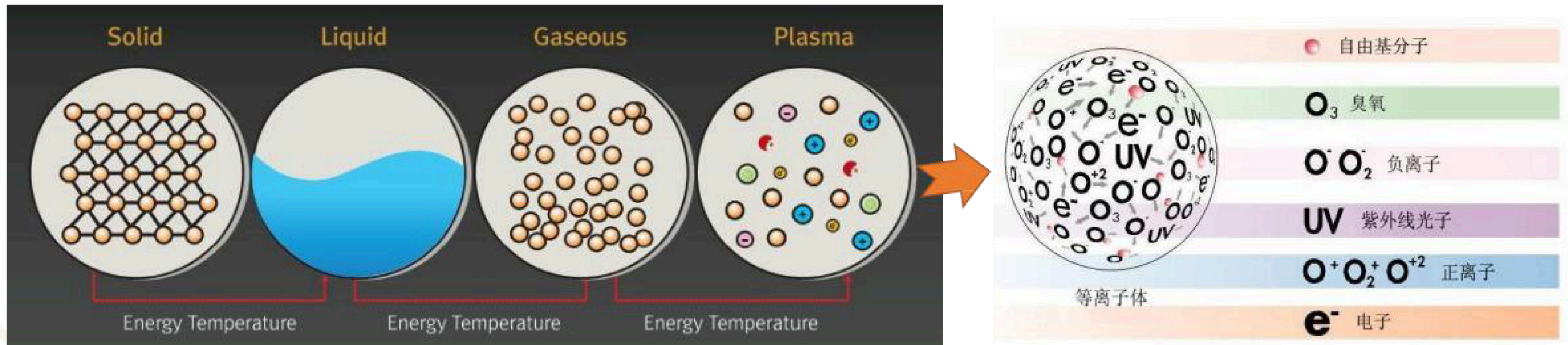
Atmospheric Pressure Plasma Surface Treatment Technology Applications in the PCB Industry

1. Principles of Atmospheric Pressure Plasma Surface Treatment
2. Applications of Atmospheric Pressure Plasma Surface Treatment in the PCB Industry
3. Introduction to Atmospheric Pressure Plasma Surface Treatment Equipment

1. Principle of Atmospheric Pressure Plasma Surface Treatment

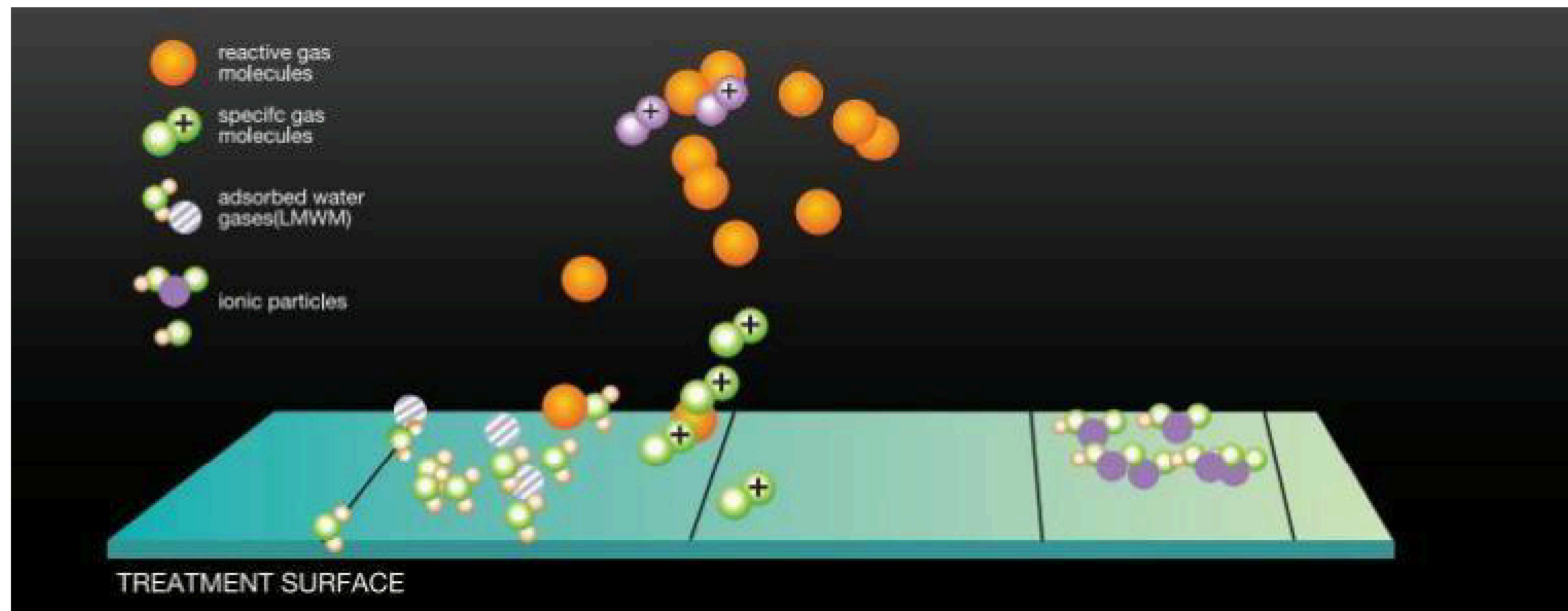
1. What is atmospheric pressure plasma

Under a non-vacuum environment, air is subjected to high temperature and high pressure to generate ionized plasma. The total positive and negative charges of cations and anions in the plasma are nearly equal, so



1. Principle of atmospheric pressure plasma surface treatment

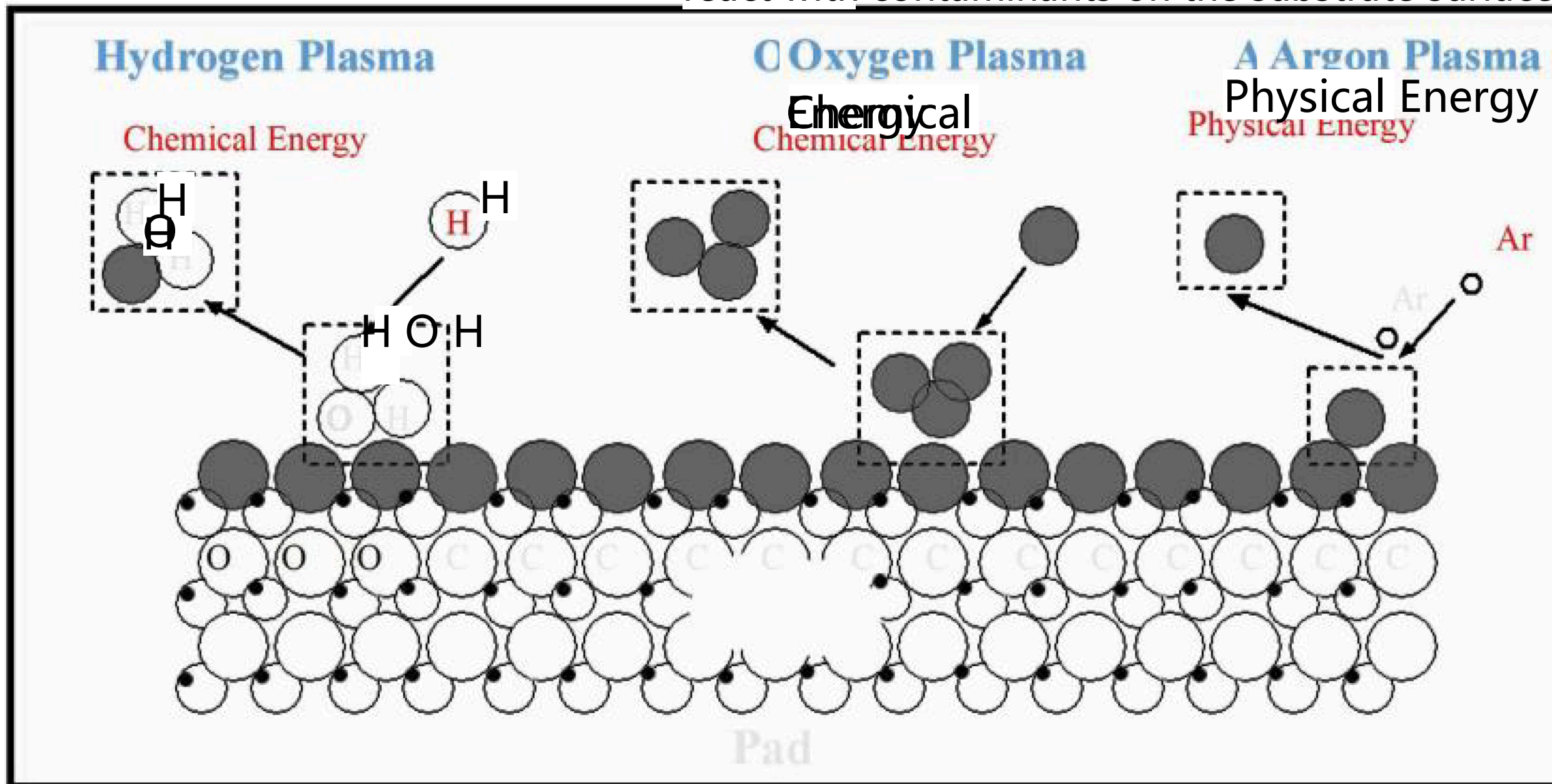
2. Mechanism of atmospheric pressure plasma surface treatment - Physical reactions Ions and electrons in the plasma bombard the substrate surface at high speed, removing contaminants attached to the substrate surface
 remove contaminants on the surface and attach functional groups to the surface. This process can clean the surface and achieve a hydrophilic effect. At the same time, the functional groups attached to the substrate surface increase the substrate



1. Principle of atmospheric pressure plasma surface treatment

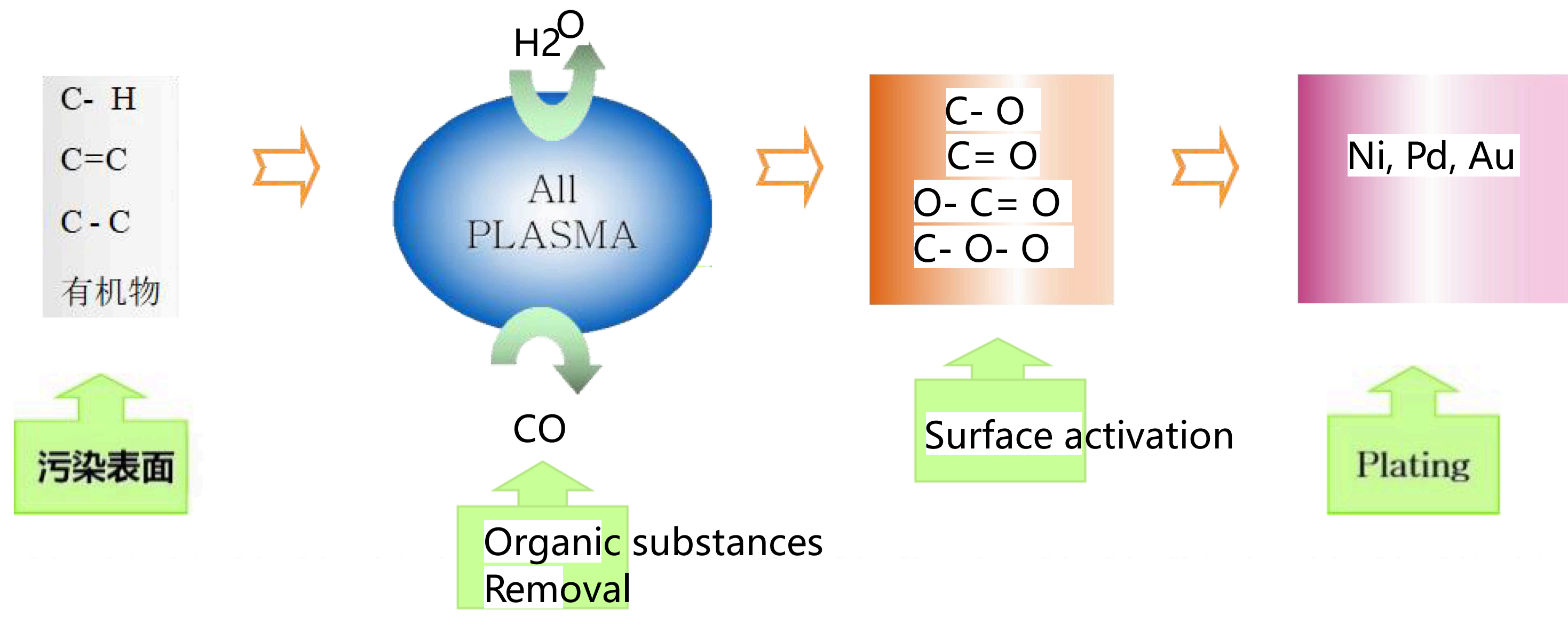
3. Mechanism of atmospheric pressure plasma surface treatment - chemical reactions

Hydrogen and oxygen ions in the plasma chemically react with contaminants on the substrate surface



1. Principle of atmospheric pressure plasma surface treatment

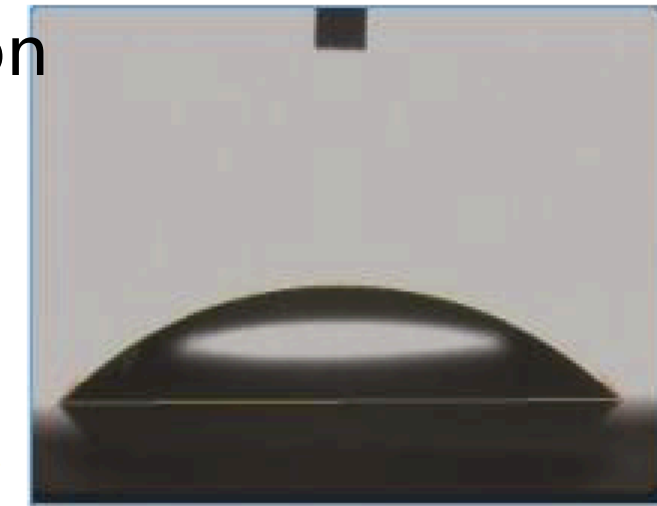
4. Atmospheric pressure plasma surface treatment mechanisms - chemical reactions



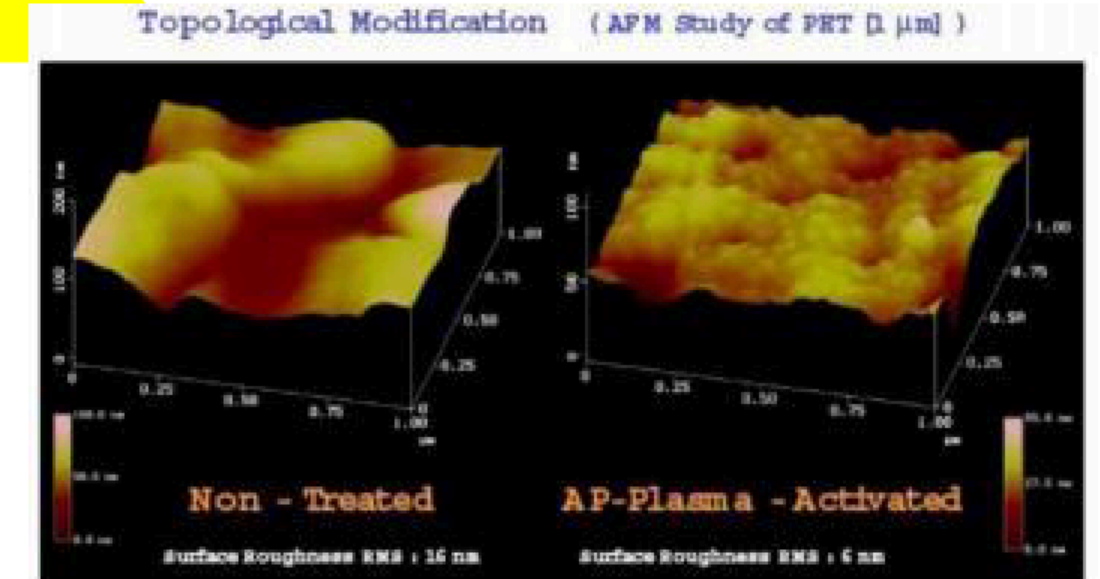
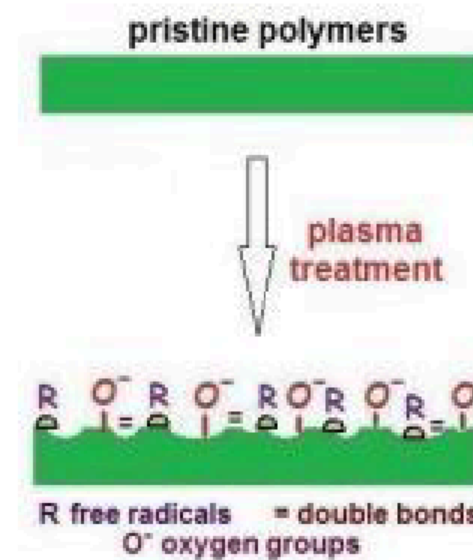
1. Principle of atmospheric pressure plasma surface treatment

5. Atmospheric pressure plasma surface treatment - Treatment effects

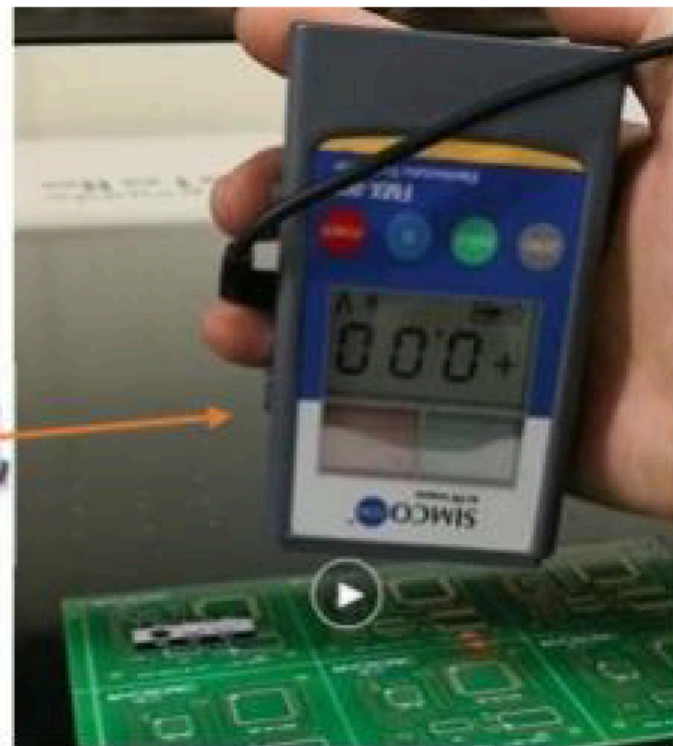
1. Remove dust and organic contaminants from the substrate surface
2. Surface activation, improving substrate surface properties: hydrophilicity, adhesion
3. Eliminate static electricity on the substrate surface



Surface tension



零静电



Processed video Processed

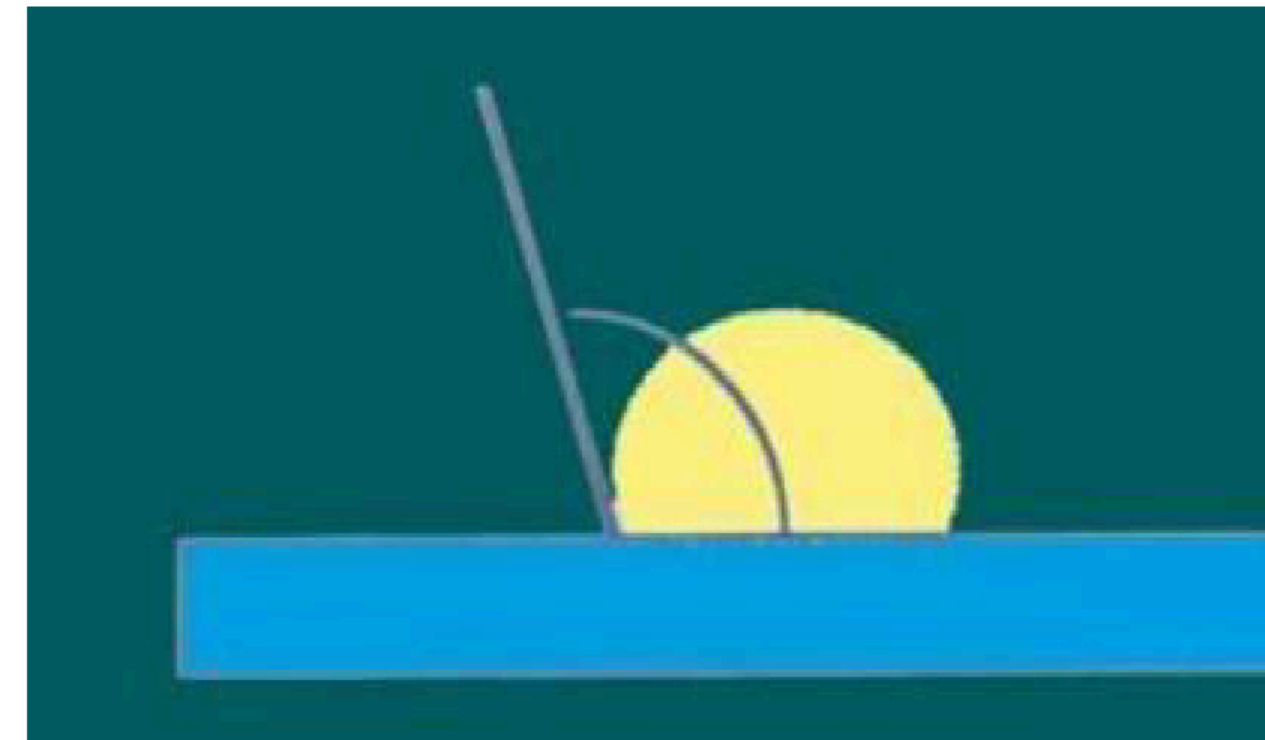
1. Principle of atmospheric pressure plasma surface treatment

6. Atmospheric Pressure Plasma Surface Treatment - Advantages

1. Environmentally friendly, no chemical solvents required
2. Low cost, only electricity and air are needed
3. Dry cleaning, simple cleaning process
4. Atmospheric pressure treatment, no vacuum required, high efficiency, suitable for online cleaning

1. Principle of atmospheric pressure plasma surface treatment

7. Atmospheric Pressure Plasma Surface Treatment - Inspection Methods Dyne Pen



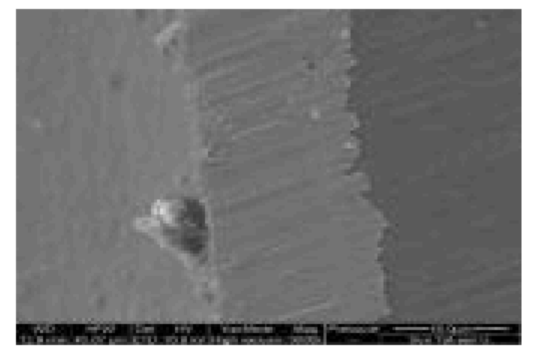
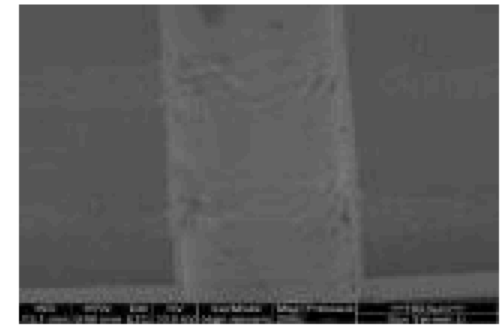
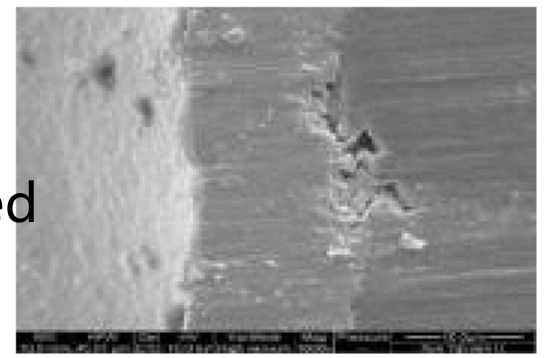
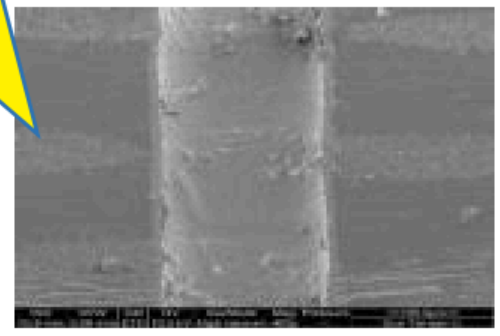
Water Drop Contact Angle Test

2. Atmospheric Pressure Plasma Surface Treatment Applications in the PCB Industry

1. PCB fabrication

1. Etching of hole walls after drilling and desmearing to remove drilling residue from the hole walls. 2. Removal of carbides after laser drilling of blind vias. 3. Removal of dry film residues during fine line fabrication. 4. Surface activation of hole walls in PTFE materials before copper

Improve adhesion between copper foil and substrate



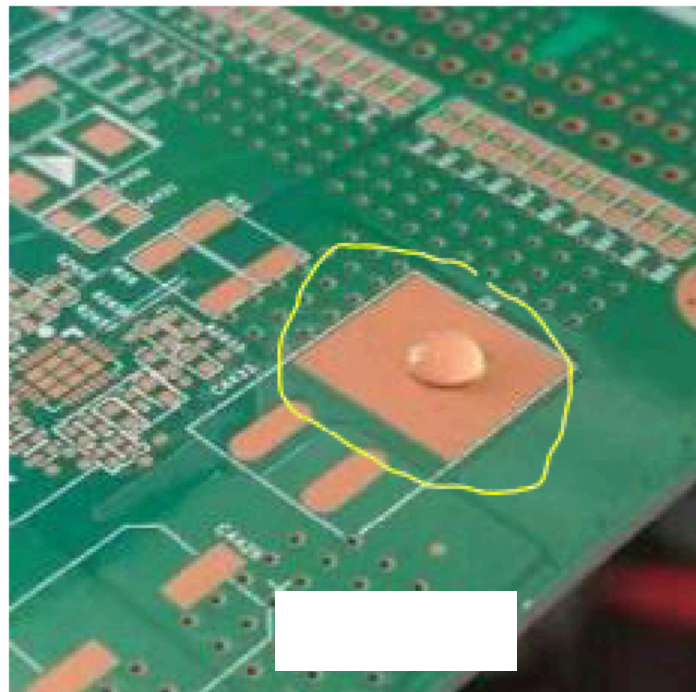
Enlarged

Condition of copper deposition before treatment After treatment Condition of copper deposition after treatment Before treatment Treatment

Before and after plasma treatment — copper deposition on PTFE substrate surface
 Before and after plasma treatment — copper deposition in through-holes

2. Atmospheric pressure plasma surface treatment applications in the PCB industry

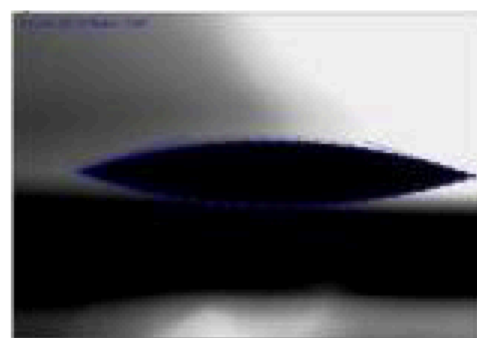
2. PCB solder paste pre-treatment Before treatment After treatment



Improved yield



WCA ~ 71.8°



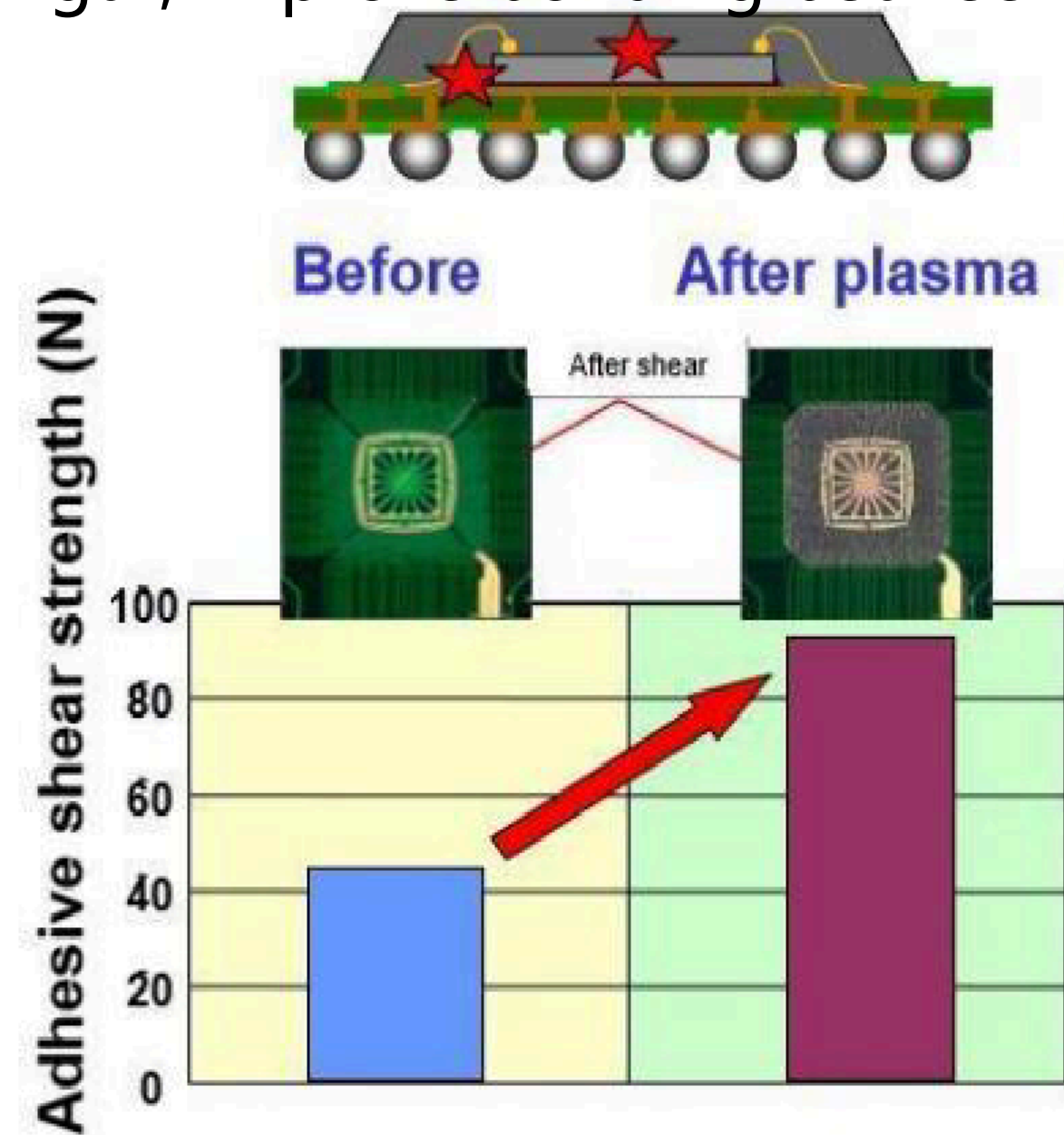
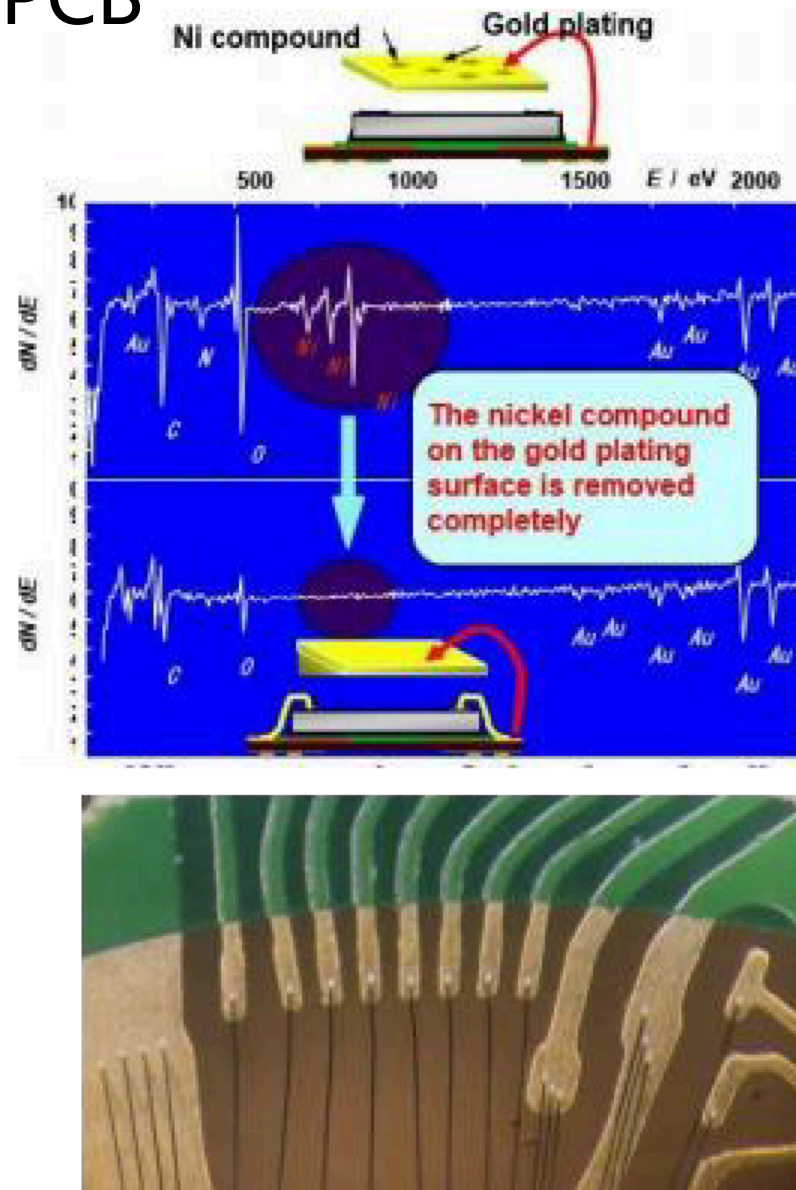
18°

Cleaning and activating pads; improving pad tinning

Comparison of pad hydrophilicity before and after plasma treatment

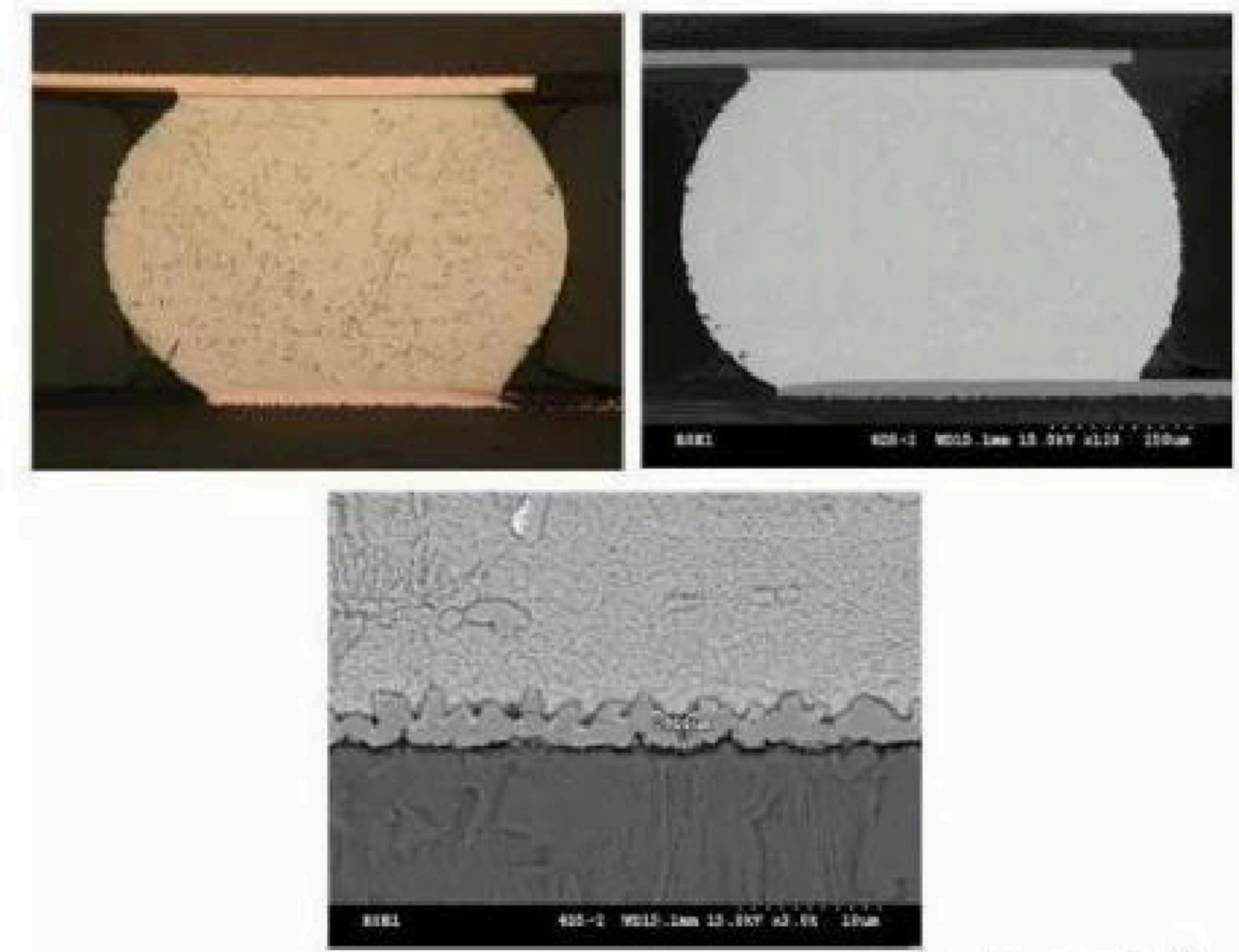
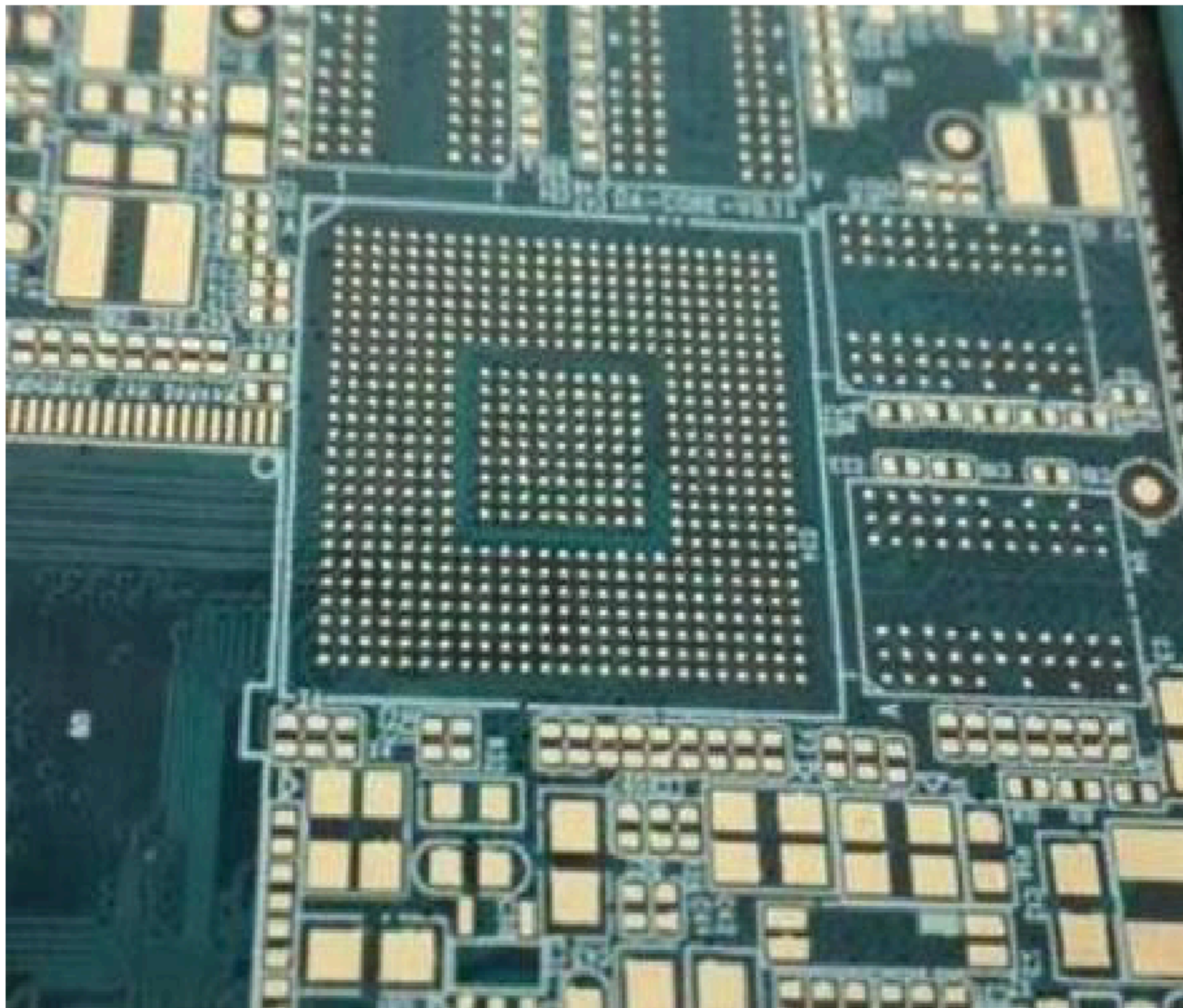
2. Atmospheric Pressure Plasma Surface Treatment Applications in the PCB Industry

3. Wire Bong process: Improve Wire Bong pull strength; improve bonding between DIE and PCB



2. Atmospheric pressure plasma surface treatment applications in the PCB industry

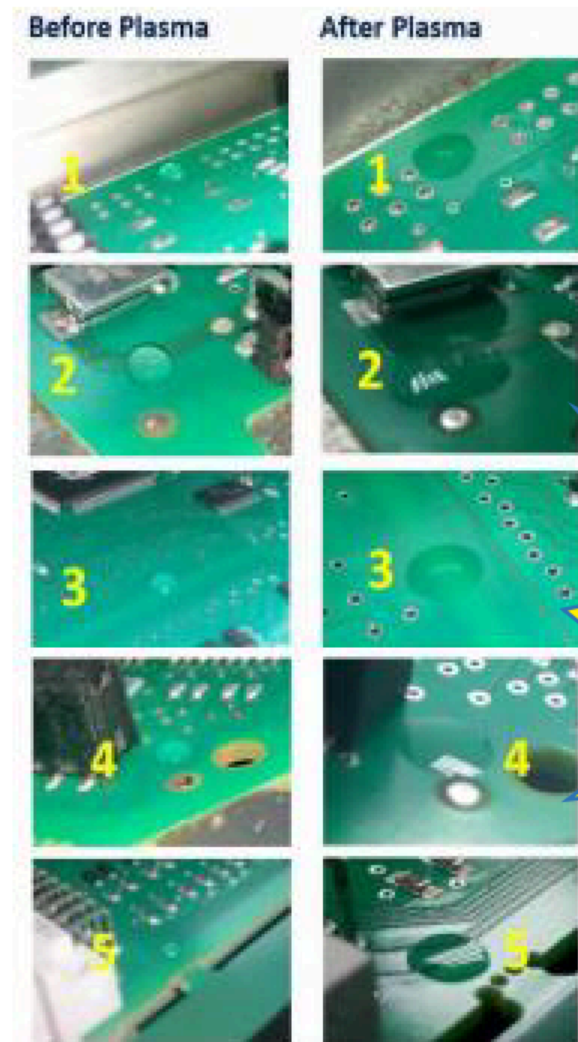
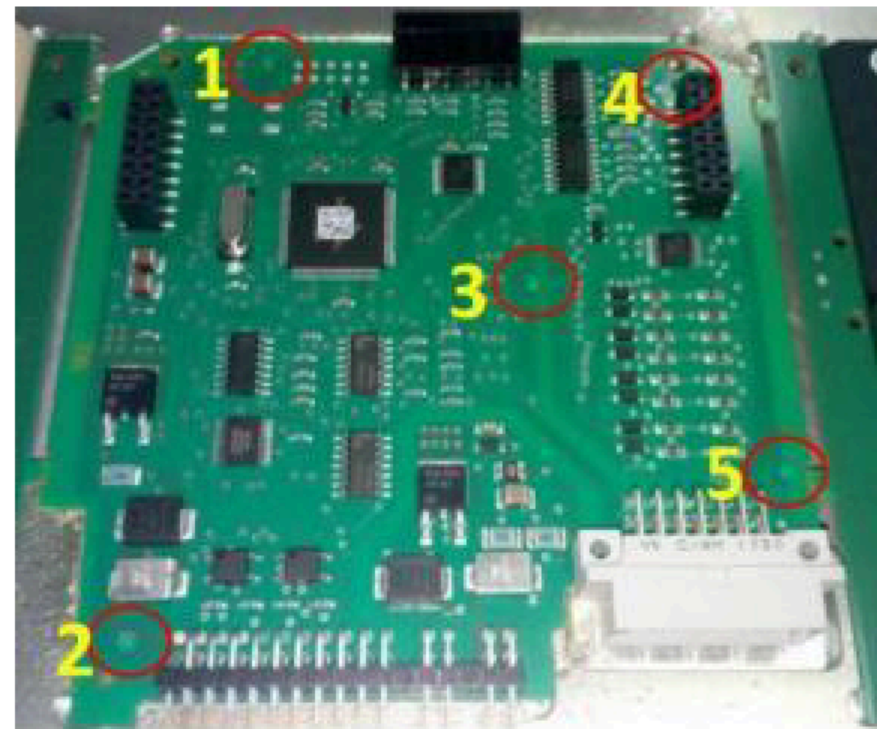
4. BGA pad treatment



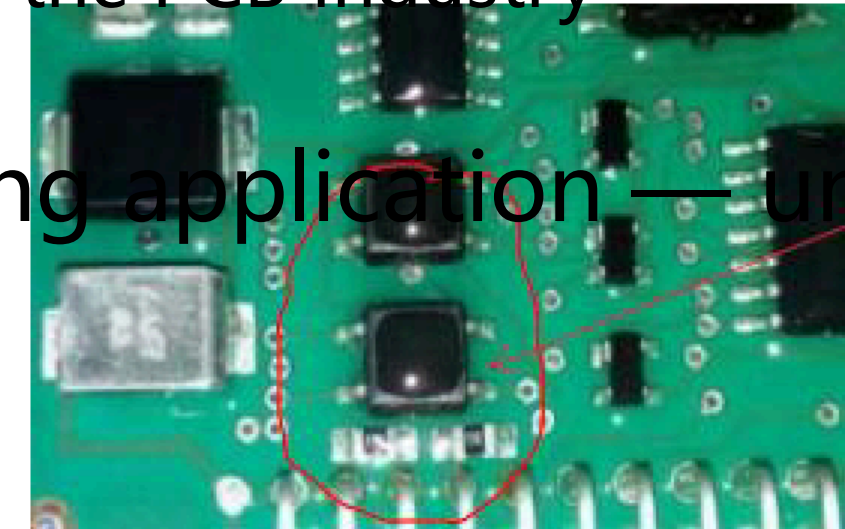
Activate PCB BGA pads to reduce open solder joints and cold solder joints

2. Atmospheric pressure plasma surface treatment applications in the PCB industry

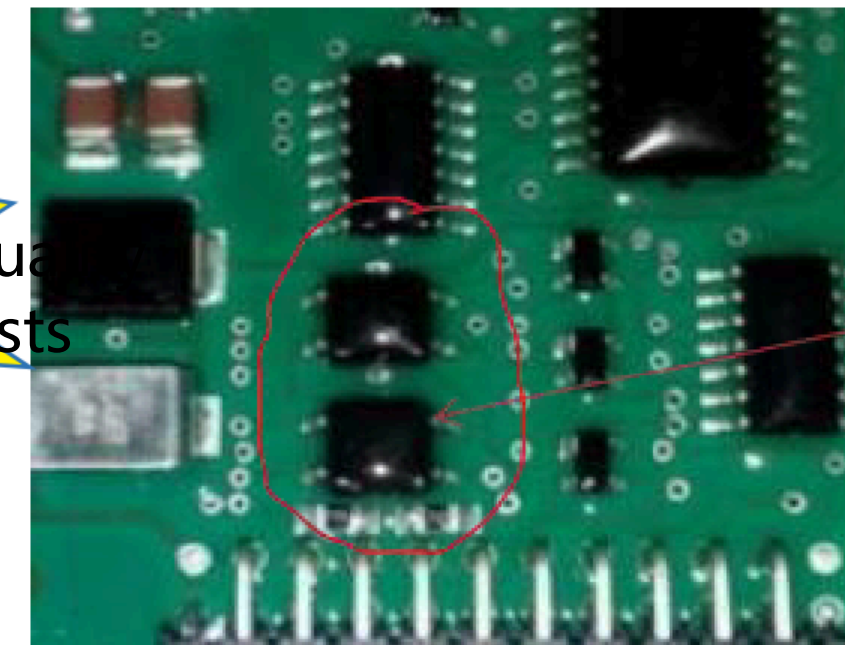
5. PCB pre-treatment before conformal coating application — uneven



Improve coating quality
Reduce coating costs



Before treatment



Uniform coverage

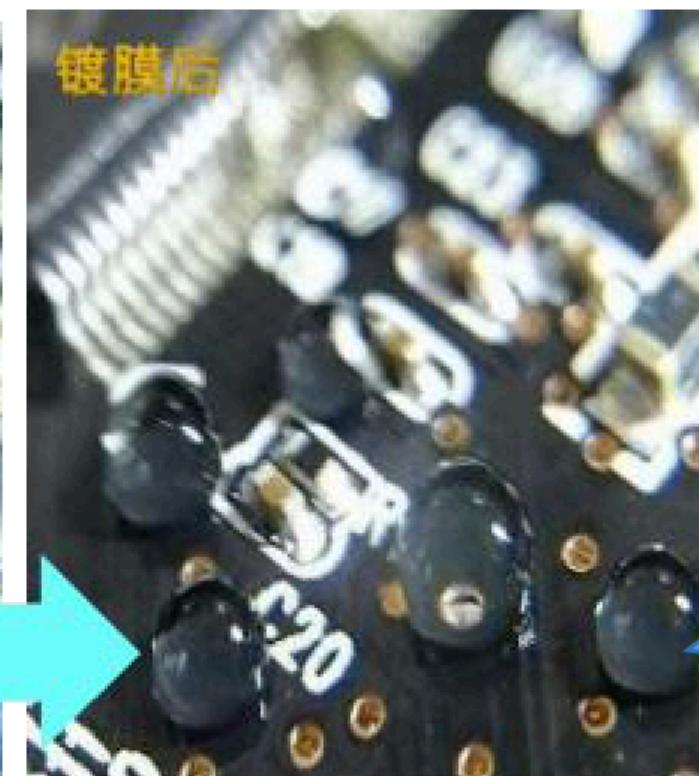
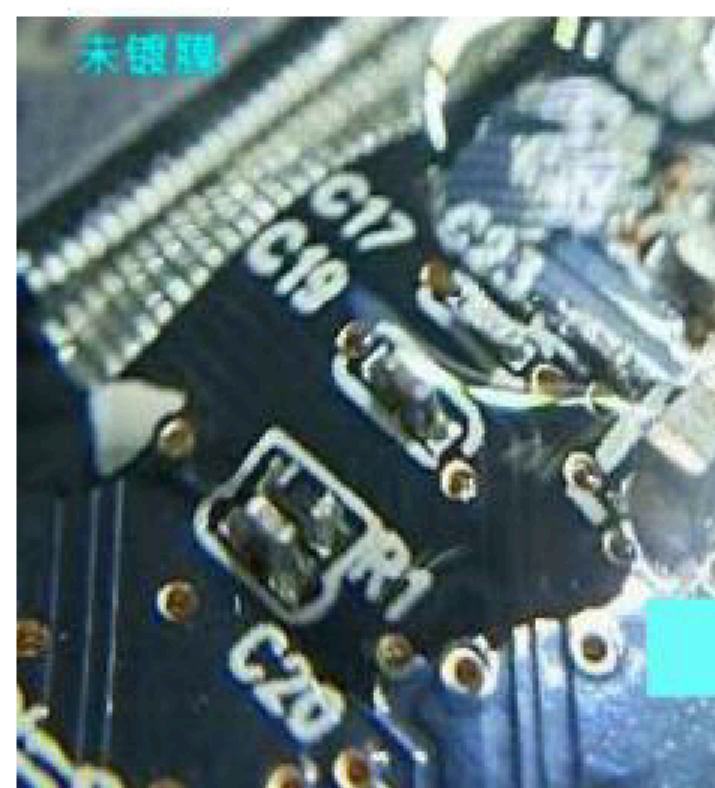
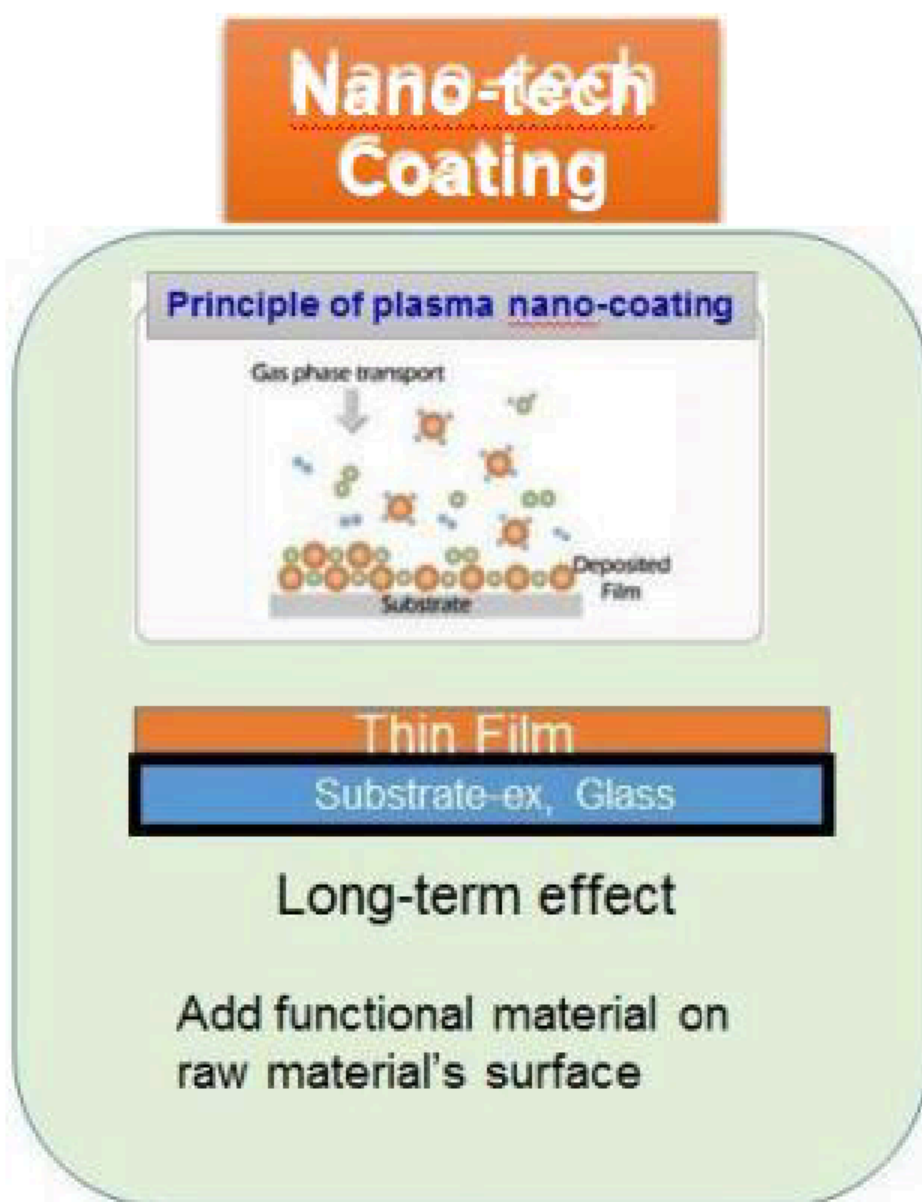
After treatment

Reduce cold solder joints Comparison of PCB hydrophilicity before and after plasma treatment
Comparison of coating effects before and after plasma treatment

2. Atmospheric pressure plasma surface treatment applications in the PCB industry

6. PCB electronic waterproof coating

Electronic waterproof coating



3. Introduction to Atmospheric Pressure Plasma Surface Treatment Equipment

1. Equipment Parameters



Name	Main Parameters
Plasma System (3D+iREV
电源 (Power Supply)	220V/AC, 50/60Hz, 6A (Max)
Power	800W
喷头尺寸 (Discharge Head Size mm)	20, 40, 60
喷头数量 (Discharge Head Qty) 1pcs
工作气体 (Gas)	Compressed Air (0.24Mpa)

3. Introduction to Atmospheric Pressure Plasma Surface Treatment Equipment

2. Equipment Specifications



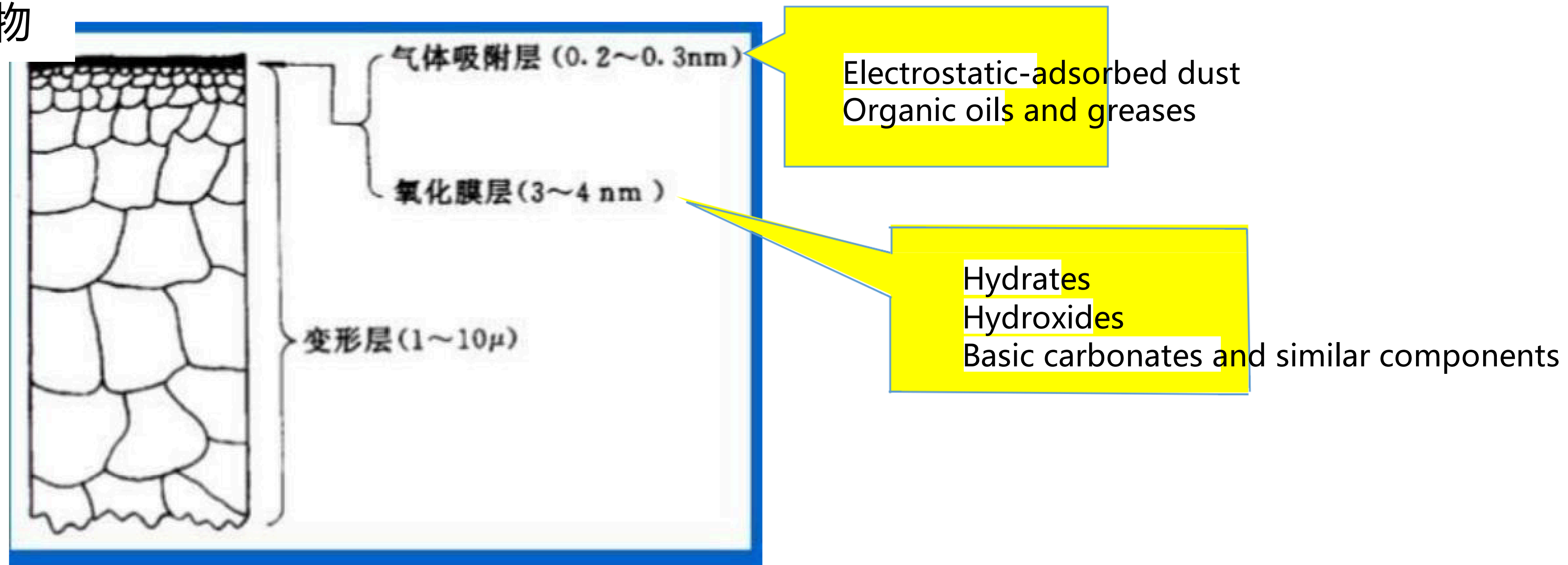
Machine size: 1240*1200*1680mm (L*W*H)	
Guide system: Automatically adjustable track width Automatic	
PCB尺寸 PCB size: 60*60mm ~400*430 mm	
Machine weight: approximately 500KG	
Voltage/power: 220V/1.5Kw	
Drive system: Stepping control system	
Limit system: Sensor	
Transmission parts: Belt	
自动调宽Automatic adjustable: 是 YES	
移动速度 Moving speed: 1-500mm/sec	
Control system: 4-axis CNC system	
操作界面Operation interface: VECTRON Control Software	
Error Alarm is YES	
Air purification system Optional	



Atmospheric-pressure plasma application locations on the SMT line



Atmospheric pressure plasma treatment PCB board PAD mixing 物

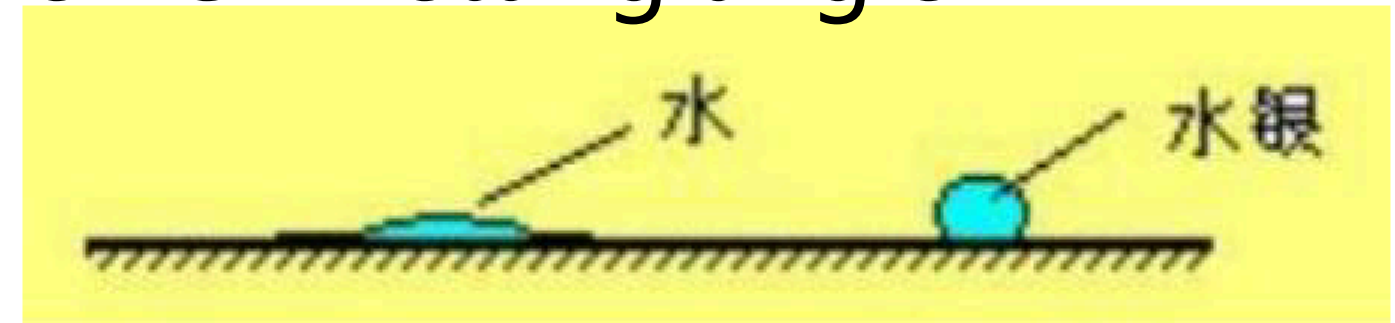


Contamination layer on the PCB surface

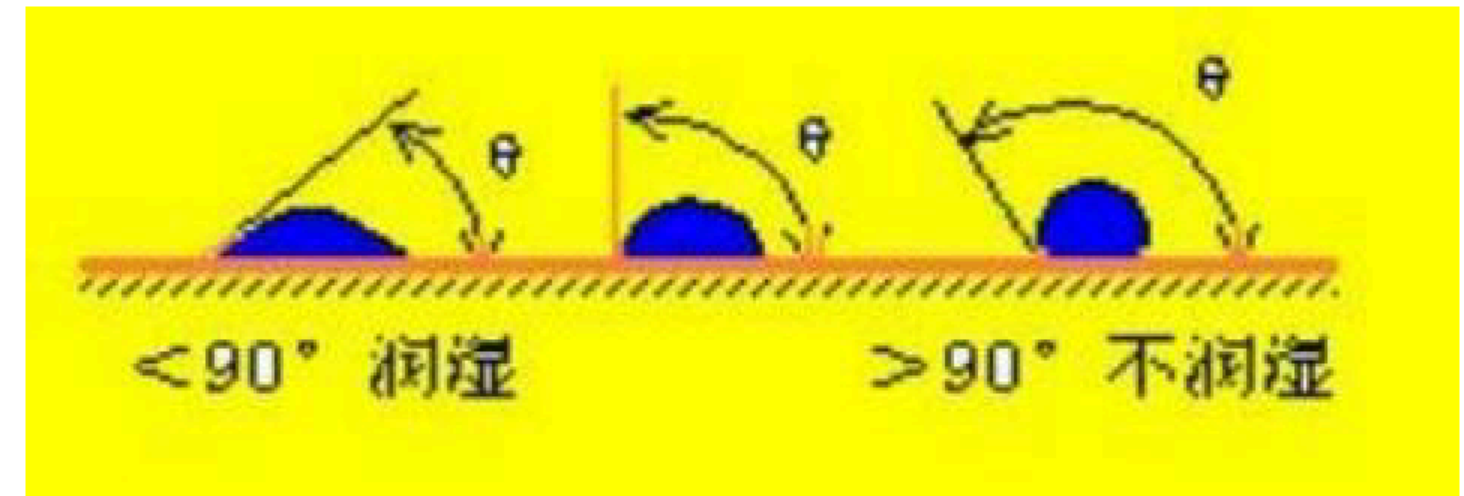
Atmospheric-pressure plasma improves the PCB wetting angle

Wettability

液体在固体表面漫流的物理现象
 润湿是物质固有的性质
 润湿是焊接的首要条件

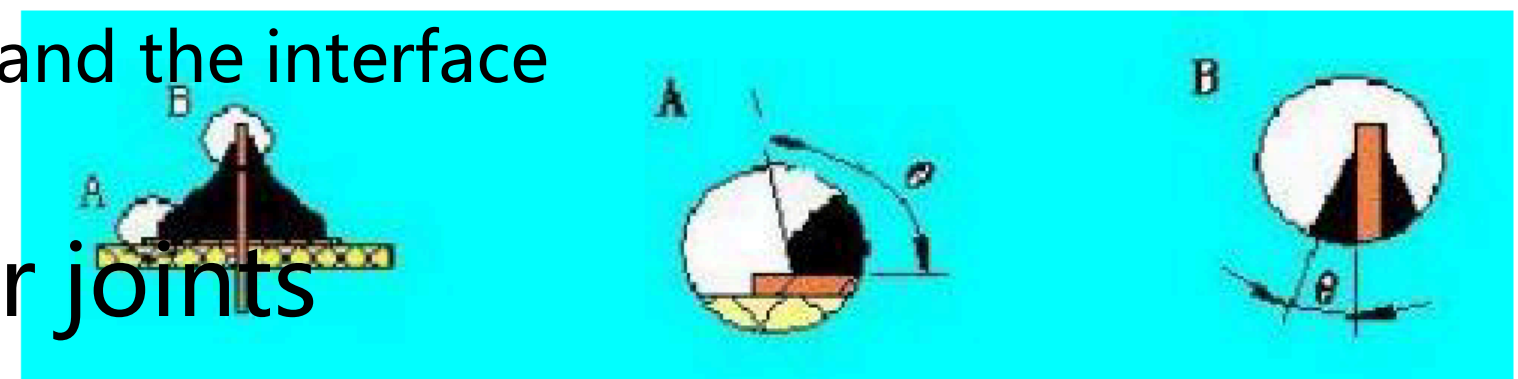


Wetting angle θ



θ = the interface between the solder and the base material
 The angle between the tangent to the solder surface and the interface

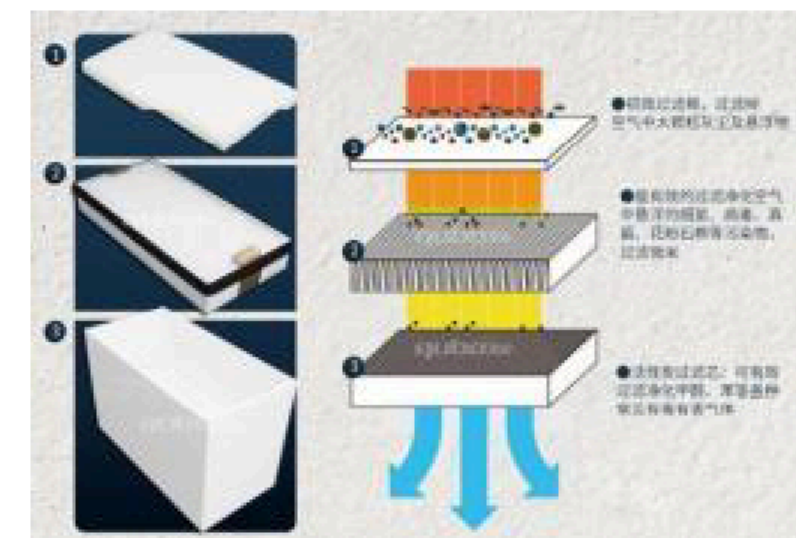
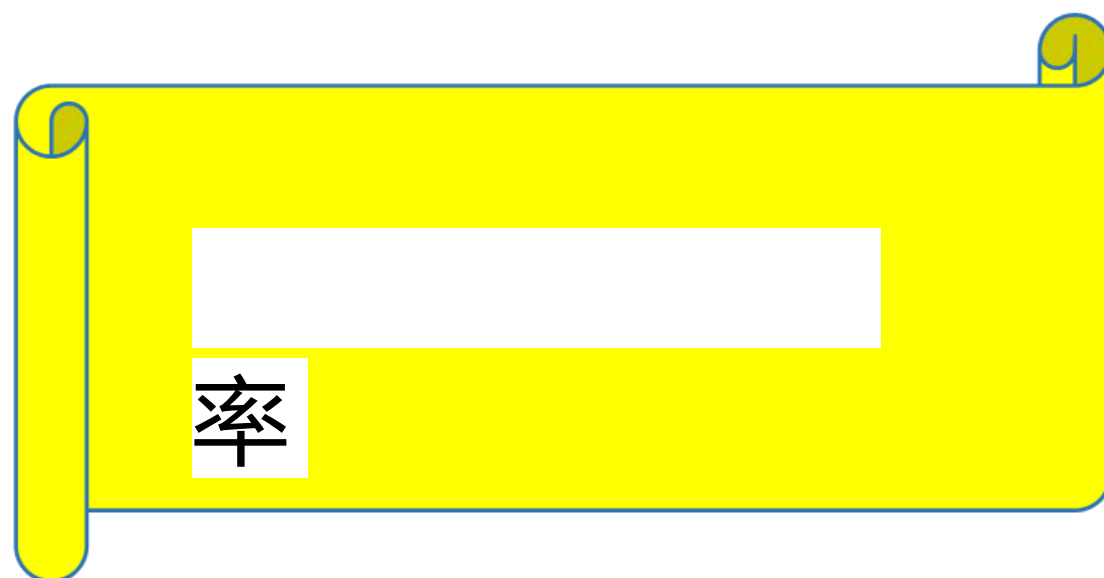
The optimal wetting angle for solder joints
 15–45 °



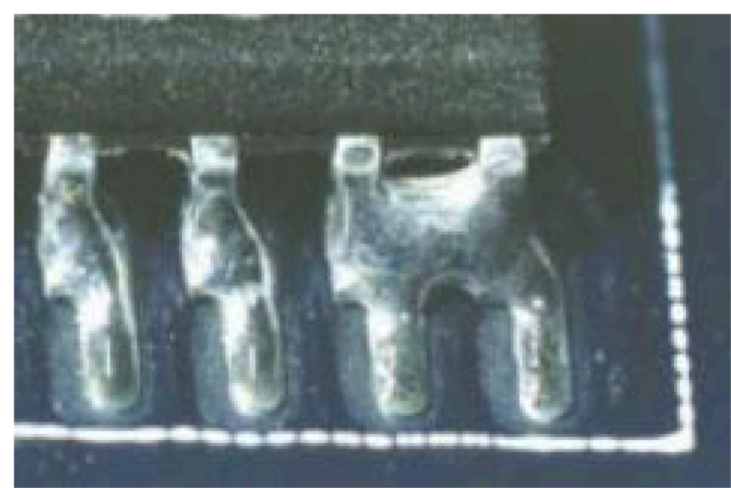
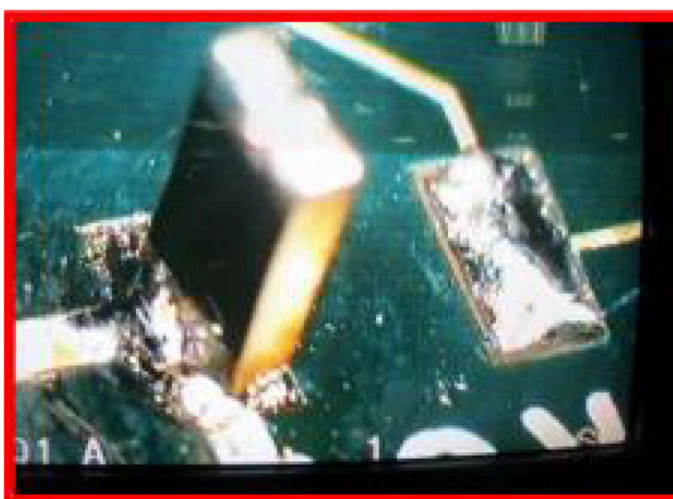
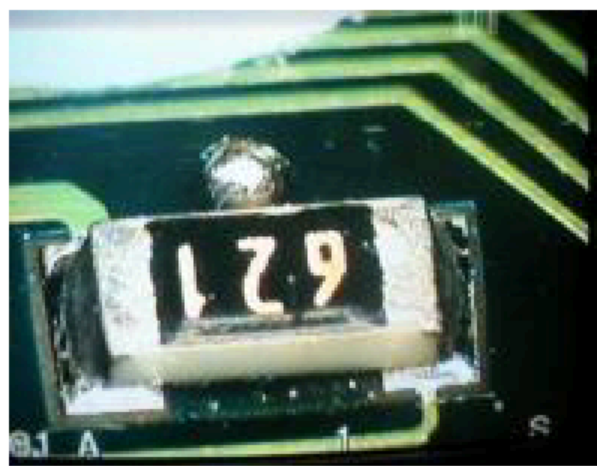
When $\theta = 0^\circ$ the surface is completely wetted; when $\theta = 180^\circ$ the surface is completely non-wetted;

Purpose of Atmospheric Pressure Plasma Application in SMT Line

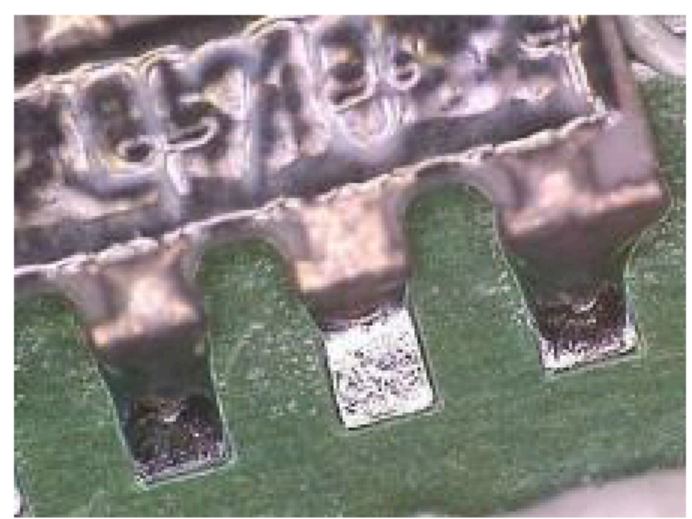
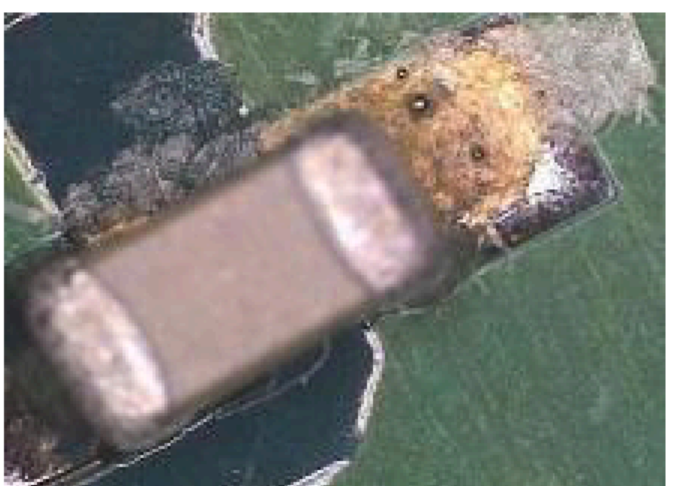
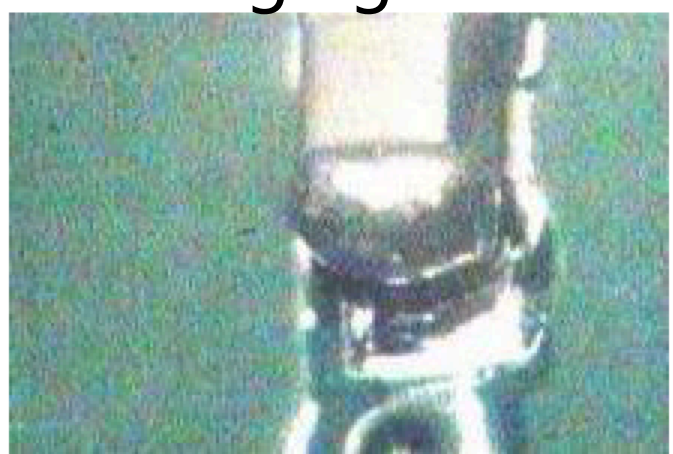
1. Clean dust, organic matter, and light oxides from PCB pads
2. Eliminate PCB static electricity
3. Activate pads
4. Increase pad adhesion to solder paste, improve stencil printing performance, and enhance SMT yield



Atmospheric pressure plasma improvement of common SMT defects



Solder ball Monument
Bridging



No-wetting Open solder Insufficient solder

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