



## Solar EVA Film Introduction

### Product properties:

Our product is made of ethylene vinyl acetate (EVA) copolymer with various necessary additives.

Its main functions in solar cell encapsulations are as follows:

- a. Support and fix solar cells;
- b. Increase the transmittance of sunlight;
- c. Resist harmful environmental factors;
- d. Electrical insulation and heat conduction;
- e. Strong bonding strength, excellent PID resistance.

The following qualities of our product are assured:

- a. Excellent peeling strength after aging ensures that the components will not delaminate for 25 years outdoors;
- b. Low shrinkage ensures stable quality during lamination;
- c. Rapid curing improves lamination production efficiency;
- d. Excellent weather resistance (including high temperature, high humidity, UV, etc.), anti PID;
- e. High light transmittance ensures the maximum power of components and reduces the cost of component manufacturers;
- f. It has good adaptability to various types of backplane materials.

### Product model:

ZR-920 (High transparency and anti-PID) : This type is mainly used on the front of the components. Excellent UV transmittance can improve the conversion of power.

ZR-921 (High UV cut-off and anti-PID) : This type is used on the back of the component to protect the backplane from UV damage and extend the service life of the component. Low UV transmittance and excellent product stability;

BJ-505 (Fast curing type) : This type is mainly used in the application and small components market, and its excellent transmittance and fast curing ability can provide the application market with more stable performance and higher cost-effective encapsulations materials.



## Technical standards

Performance	Product model		
	ZR-920	ZR-921	BJ-505
Thickness (mm)	0.2- 1.0	0.2- 1.0	0.2- 1.0
Width (mm)	≤2300	≤2300	≤2300
Length of each roll(m)	150-350	150-350	150-350
Surface density deviation (%)	±4	±4	±4
Density (g/cm <sup>3</sup> )	0.90-0.98	0.90-0.98	0.90-0.98
Crosslinking degree (%)	≥75	≥75	≥75
Tensile strength (MPa)	> 18	> 18	> 18
Elongation(%)	>550	>550	>550
Vapor permeability(g/m <sup>2</sup> /day)	≤5.0	≤5.0	≤5.0
Peeling strength from glass(N/cm)	≥60	≥60	≥60
Peeling strength from backplane (N/cm)	≥40	≥40	≥40
Shrinkage(%)	Longitudinal (MD)	≤3.0	≤3.0
	Lateral (TD)	≤1.5	≤1.5
Volume resistivity(Ω·cm)	≥1*10 <sup>15</sup>	≥1*10 <sup>15</sup>	≥1.0*10 <sup>15</sup>
Brokendown voltage intensity (kv/mm)	≥28	≥28	≥28
Yellowness index△ YI ( 120kwh/m <sup>2</sup> ,290-380 nm1000 h)	≤4	≤4	≤4
Yellowness index△ YI (85°C/85% 1000 h)	≤4	≤4	≤4



Light transmittance(%)	wavelength 380- 1100nm	≥91	≥91	≥91
	wavelength 290-380nm	≥80	≤30	---

The crosslinking degree should be controlled within the qualified range of about 85%. Other auxiliary materials used need to have qualified standards from industry recognized testing institutions.

### Anti-PID products:

ZR-920 and ZR-921 are our company's anti-PID products. Using our company's anti-PID products, we test the PID of the packaged components at 60 °C and 85% humidity. After 96 hours, we test the I-V characteristic curve and EL image of the components.

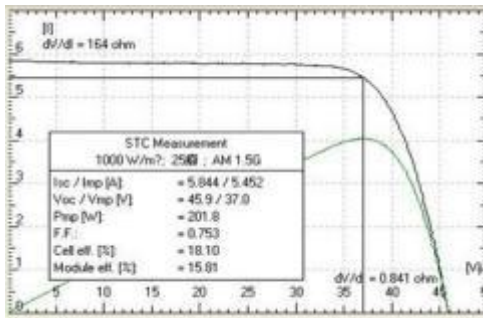
Test results of I-V characteristic:

Brand	state	Isc(A)	Voc(V)	Pm(W)	FF(%)	Pm retention rate	FF retention rate
BAOJUN	original	5.844	45.90	201.8	75.30	-----	-----
	After 96 hours	5.853	45.80	201.0	75.00	99.60%	99.60%

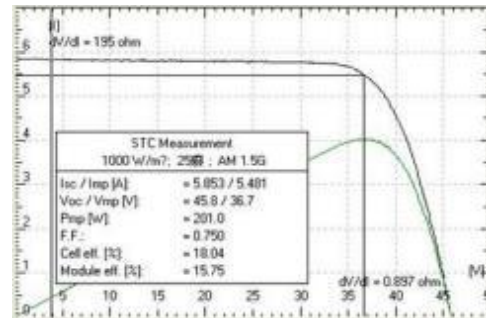


Curve:

Before testing:

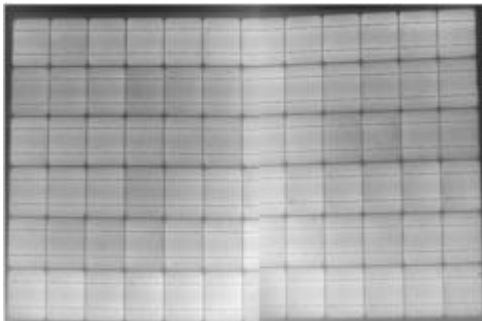


96 hours later:

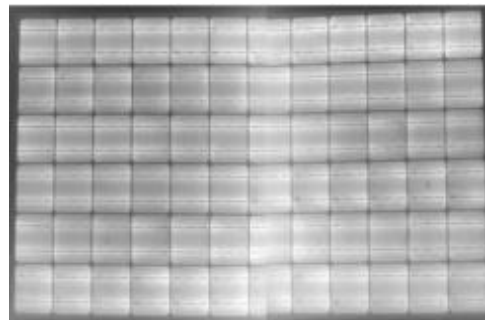


EL image:

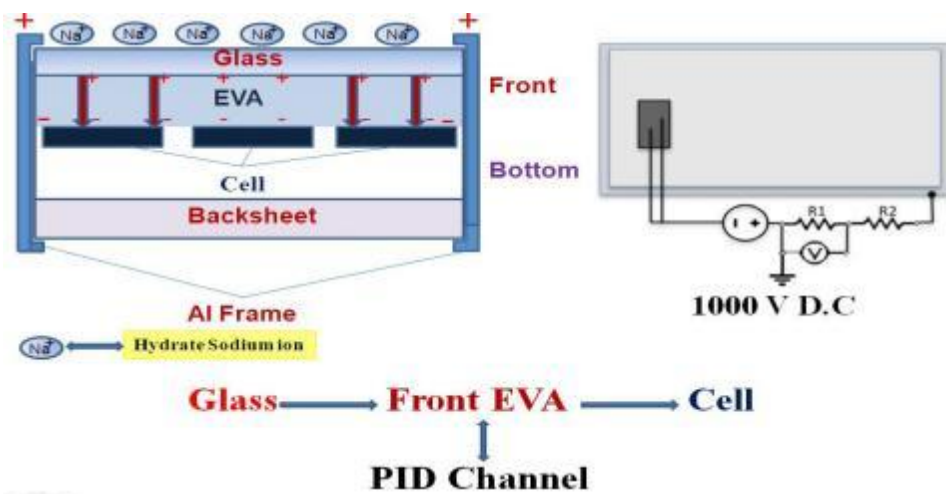
Initial:



96 hours later:



PID improvement scheme:



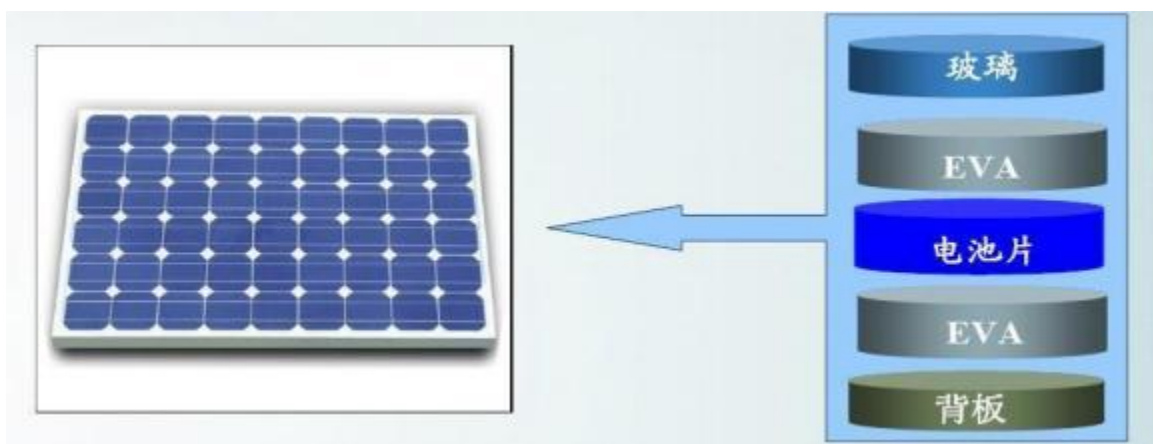


## PID Channel for Silicon Components

As can be seen from the above figure, the sodium ion which is hydrated on the glass surface during the PID attenuation is free and moves to the inside of the component under the negative bias. As a result, the passivation effect on the surface of the battery sheet is deteriorated and the filling factor FF, short-circuit current density  $J_{sc}$ , open-circuit voltage  $V_{oc}$  are reduced significantly. The final component power is much lower than the design standard.

1. Select raw materials with high purity; Increase the volume resistivity, decrease the permeability and wet leakage resistance.
2. Improve the production process and select materials with lower polar functional group content to increase the density of EVA film and reduce its water absorption.
3. Select a battery sheet with  $\text{SiN}_x$  coating refractive index greater than 2.15 on the surface of the battery sheet.

## Lamination technique:





Product model	Laminating temperature(°C )	Vacuum pumping time (mins)	Laminatingtime ( mins)
BJ-505	140±2	5±0.5	8± 1
ZR-920	142±2	5±0.5	11± 1
ZR-921	142±2	5±0.5	11± 1

Note: The temperature and time of the laminator can be adjusted to meet the production requirements according to the condition of the operating equipment.

### **Product specification and packaging :**

1. Thickness: The thickness of products we can provide is between 0.2 mm and 1.0mm. The conventional thickness is 0.45mm. Other specifications are non-standard;
2. Width:  $\leq 1400\text{mm}$  ;
3. Vacuum packaging and inner packaging is 150 meters each roll (except for special requirements).

### **Storage and use:**

1. The product should be stored in a cool and dry constant temperature room where temperature is lower than 30°C and humidity lower than 60%; The storage period is eight months; It is recommended to use it up within three months;
2. If the product is stacked for a long time, the height should not be too high, and it is appropriate to be below five layers to avoid bending and deformation due to heavy pressure;
3. It is not recommended to use each roll close to the paper tube and the outermost circle;
4. Do not damp the product. It is recommended to use up the film after opening the package or cutting it within 48 hours.