

Technical Informer
SOLAR CELL RIBBON PEEL TESTING

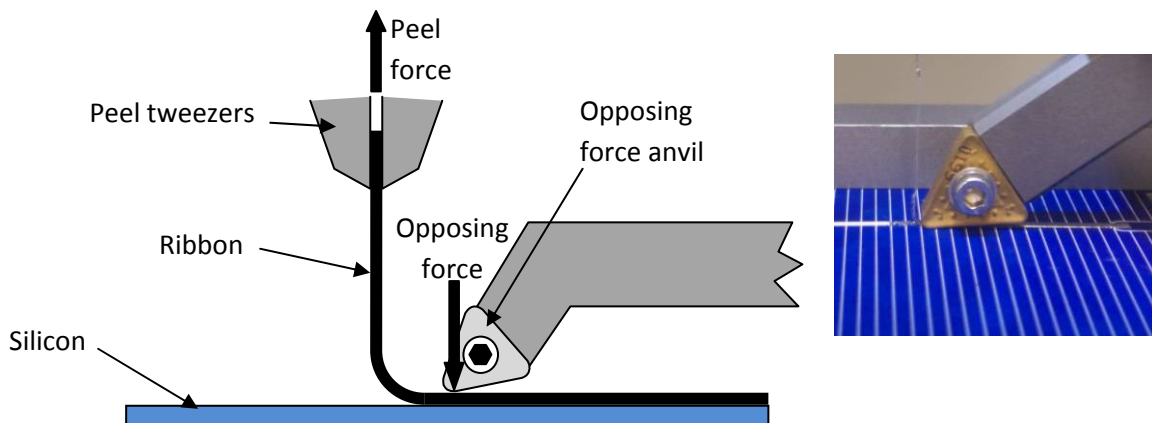
Introduction

The mechanical, electrical and thermal quality of ribbon bonds to the silicon solar cell they are mounted to is important to optimise yield, electrical efficiency and life expectancy. Such bonds can be tested using a ribbon peel test where the force required to peel (break) them and the observed failure mode are used to characterise quality. Testing is often difficult due to the fragility of the silicon. The silicon is normally thin and may have micro cracks when soldered due to thermal mismatch during cooling. To peel the ribbon an opposing force must be applied to the silicon. Providing an opposing force by clamping the silicon often results in the silicon breaking. Consequently the strength of the bond is unknown.

The XYZTEC test method avoids this problem by applying the opposing force through the ribbon.

The XYZTEC Solar Ribbon Peel Test




The principle of the test is illustrated below.



The ribbon is gripped and pulled as in any conventional peel test. Instead of clamping the silicon the opposing force is applied through the ribbon, slightly in front of the advancing peel fracture.

Results

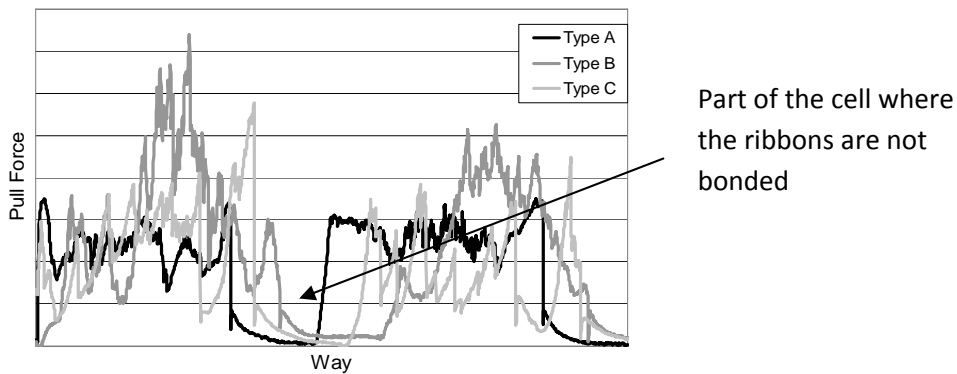
Three principle failure modes may be observed.

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Bond failure - Low peel force/strength (none wet)
- 
URM (Under Ribbon Metallisation) failure – High peel force
- 
Silicone failure – Silicone damage during manufacture

- The preferred mode is URM failure. This indicates a reasonable bond strength which has been characterised by the test.

- Bond failure shows a poor bond with low strength.
- Silicone failure can indicate that the silicon has been damaged during manufacture. In this case if the silicone had been clamped the complete cell would most likely fracture.
- If the conventional approach of clamping the silicon is used, complete cell fracture is also likely with a strong bond.

In addition to the failure mode force displacement graphs are provided. These show the strength of each ribbon through the peel test enabling characterisation and comparison between samples.



The System

The test is can be done on a standard Condor machine fitted with our Silicon Solar Cell test system

