

## Study on Anti-reflection Coated Glass for Photovoltaic Modules

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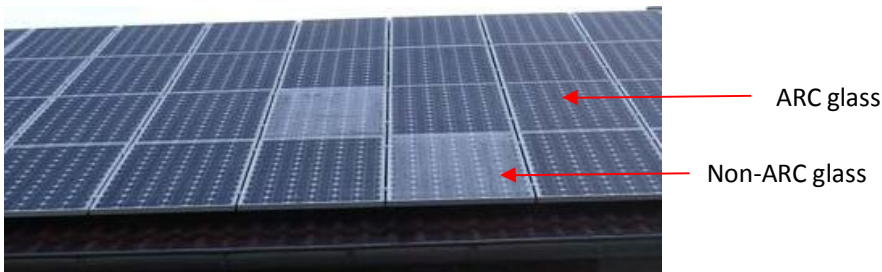
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Photovoltaic modules with higher power are pursued by both module manufacturers and end users. In order to increase modules' power output, anti-reflection coated (ARC) glass as one of many technical methods, has been studied at Suntech since 2006 with a dedicated partner. This paper reported Suntech's work on ARC glass.

### (1) Verification of Power Gain

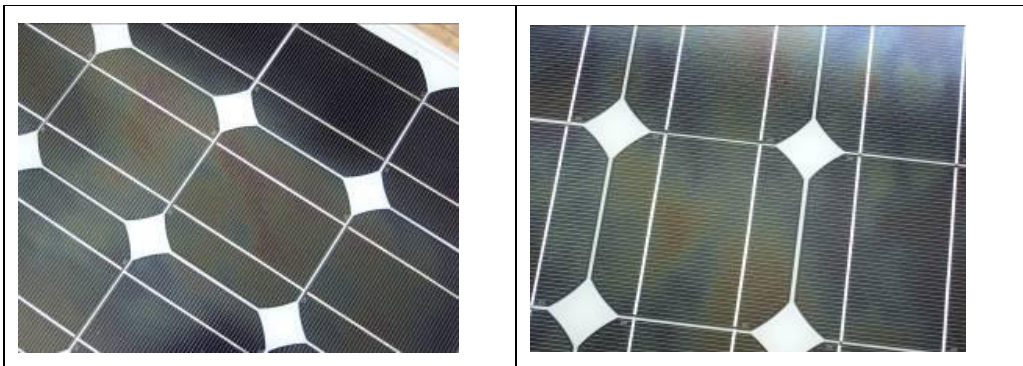
A certain percentage of power gain from using ARC glass for photovoltaic modules is critical to cover the cost on the coating process. In past 5 years, the percentage of power gain increased from about 0.8% to 1.5%, 2.5%, and to about 3% now, based on transmittance measurement of ARC glass and indoor I-V measurement of modules.

In order to verify that ARC glass works in the field, module arrays were installed outdoor for long-term purpose. Actual electricity generation indicated that ARC modules performed well as expected. Normalized output indicated modules with ARC glass even performed better than non-ARC modules because of better self-cleaning and low-angle effect of ARC glass. It should be pointed out that modules with ARC glass would be visually different from modules with non-ARC glass in the field as shown below. It is not recommended to mix using them in the same application.







### (2) Coating Uniformity

Uniform coating is very important both visually and functionally. Modules with uniform ARC glass were shipped worldwide by Suntech. However, the coating uniformity was not acceptable at the very beginning as shown below.



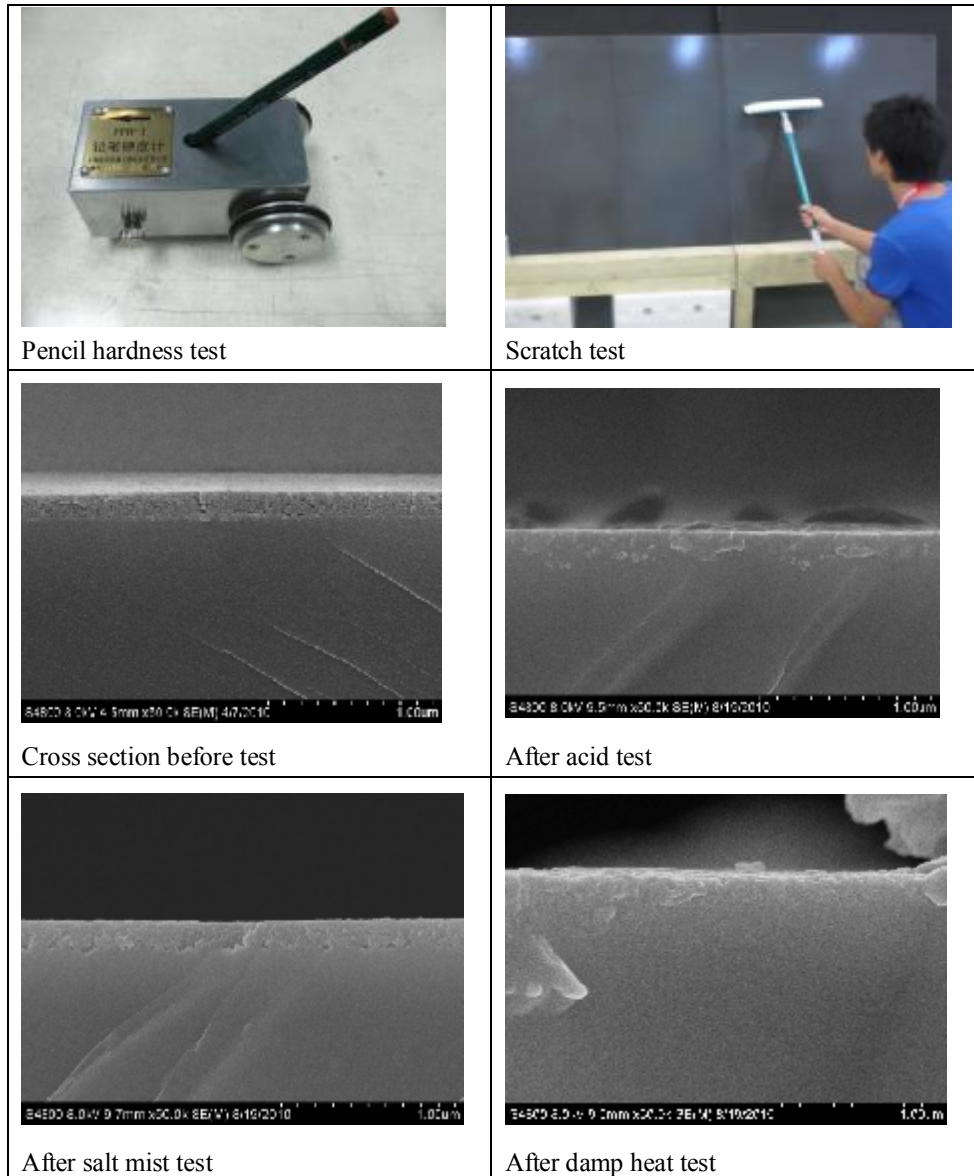
(3) Self cleaning capability

It's hoped that ARC glass can offer better self cleaning than non-ARC glass. Test shown in following pictures indicated that ARC glass has better self cleaning capability than non-ARC glass.

ARC glass	Non-ARC glass
 <p>Dust applied to ARC glass</p>	 <p>Dust applied non-ARC glass</p>
 <p>After cleaning of ARC glass</p>	 <p>After cleaning non-ARC glass</p>

(4) Indoor Reliability Test

- Modules with ARC glass passed nicely DH1000, TC200, UV, HF10 and salt spray tests per IEC and UL standards.
- Beyond standard tests, acid test, adhesion test, pencil hardness test, scratch test and SEM analysis were carried out to ARC glass. Results indicated that anti-reflection coating survived well after these tests.



(5) Conclusion

Based on our indoor reliability testing, outdoor measurement in house, and feedback from field applications, it is concluded that ARC glass is reliable, while it helps increasing power output of photovoltaic modules. The study is being continued.