Solar Sharc® Lite FAQ

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Opus Materials Technologies Ltd

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General

What is Sharc® Lite?

Sharc® Lite is a novel easy clean coating built on patented technology. It has been developed for application onto a wide range of substrates to provide protection against surface contamination and to reduce cleaning requirements. Sharc® Lite is a long lasting, easy to apply coating that rapidly cures at room temperature to give a hard, transparent, ceramic-like coating that resists the build-up of dirt and other forms of soiling and is very low maintenance.

What makes Sharc® Lite different?

The ceramic nature of the coating provides high transparency, long term durability and excellent adhesion to many substrates. The coatings characteristics include:

- Easy clean & reduces the accumulation of surface contamination
- Hydrophobic > 100° water contact angle.
- Highly repellent.
- Resistant to high temperatures - Stable to temperatures in excess of 150˚C.
- UV Resistant.
- Exceptional durability.

How does Sharc® Lite work?

The novel breakthrough of Sharc® Lite is to co-locate water repellent functional groups alongside a silica ceramic network giving a tough, durable, hydrophobic and transparent coating. The transparent coating once cured creates a film on the PV substrate. The coating acts as a barrier to reduce the accumulation of soling on the substrate keeping the surface clean and reducing maintenance costs.

Ultimate PV Protection how?

The origin of Sharc® Lite technology was research work carried on highly repellent advanced silicon based polymers. When applied as a thin film on glass these silicon polymers cure at room temperature to give a transparent glass-like material. Since glass is a silicon based ceramic the

bonding between it and Sharc® Lite is extremely strong. The ceramic-like nature of the coating means that it has a much greater durability than conventional organic coatings with the added advantage of being as water repellent as many conventional fluorpolymers but without using fluorine. This combination of high transparency, high durability and fluorine-free hydrophobicity means Sharc® Lite provides a long term, weather resistant non-stick coating for glass and PV panels that reduces the adhesion of surface contamination and minimizes the requirement for cleaning.

What do you mean by easy clean & anti-soiling?

The accumulation of dust, or other debris on the surface of PV modules leads to a reduction in power output by up to 50%. Research studies have shown that of the 17 types of dust pollutant, 6 types are likely to have significant impact on the power generation of a solar cell, including sand, dust & ash. Sharc® Lite is a novel advanced easy -clean coating which when applied reduces surface contamination.

What does resistant to high temperatures really mean?

Sharc® Lite is not only durable & easy-clean it is resistant to high temperatures and offers outstanding weather resistance. Sharc® Lite is stable to temperature in excess of 100˚C for extended periods of time and shows only minor loss in repellence after 1000 hours QUV testing.

Sharc® Lite is hydrophobic. What does this mean?

Sharc® Lite is a coating that is only a few microns thick. Consisting of silica (glass) chemically bound with repellent organic materials. Sharc® Lite readily repels water and water-borne contamination. Rather than wetting the surface water droplets form beads on Sharc® Lite and readily roll-off at low angles. Surface contamination by dust and sand is reduced because it finds it difficult to bind to Sharc® Lite and so is easily removed by the action of wind or by the use of reduced volumes of water.

You claim unrivalled protection & specification what does this mean?

With high UV & chemical resistance Sharc® Lite represents a new and disruptive coating technology for the PV sector. With key attributes such as high light transmittance, ambient curing and versatile deposition methods the coating offers a compelling anti-soling solution for the PV sector.

What is the difference between Solar Sharc® & Solar Sharc® Lite?

Both coatings are easy clean durable transparent coatings for application on to PV. The fundamental difference is that Solar Sharc® contains functionalised nano particles which bond to the resin matrix, cementing the silica nano-particles into the resin. The nano particles are smaller than the wavelength of visible light, so do not scatter light, providing a high degree of transparency and an anti- reflective property. This results in increased light transmittance and PV cell yield. The manufacture and introduction of the nano technology is a complex and expensive process and this reflects in the cost of Solar Sharc®. Solar Sharc® Lite is a similar silica based ceramic coating however without the nano additives. Accordingly, it offers the same easy clean and associated characteristics but without the AR & increase yield capability offered by Solar Sharc®.

Deposition

At the forefront of the development of Sharc® Lite has been the method of deposition. Different PV market sectors have different requirements. That's why we have focussed on the development of a coating that can be cured under ambient conditions. This versatility allows Sharc® Lite to be integrated into a manufacturing process through to retrofit deposition in the field for O&M application.

So how do you apply Sharc® Lite?

Sharc® Lite is a versatile coating technology. As a low viscosity solution based coating it can be wiped on for retrofit applications or sprayed on in OEM environments. The most suitable application for retrofit applications is wipe on with a micro-fibre cloth facilitating the solution to flow and form a uniform film*. (* full application instructions are detailed in deposition specification supplied with Sharc® Lite)

Do you have an Applicator?

We are in the R&D phase of a hand-held applicator for retrofit application. The powered applicator will facilitate application of a 2-micron coating and can uses on existing PV installations.

What other conditions should be considered when applying Sharc® Lite?

The coating should be applied at ambient temperature and at a relative humidity of 30-70%. The coating should be applied in dry conditions and never in the rain. Direct sunlight should be avoided where possible as it could affect the film forming and final properties. Strong wind conditions should be avoided, if this happens after deposition, aim to cover the asset with a suitably sized canopy, but avoid touching the coating.

How thick should the coating be?

The coating should be applied no thicker than 2 microns, to ensure optimal performance.

What is the thickness tolerance (lower and upper limit) for the current version of Sharc® Lite?

We recommend the coating should be no thinner than 1 micron, whilst film thicknesses greater than 10 microns may result in cracking.

What if I make an error when applying through wipe application?

Mistakes can be rectified within 10 minutes.

How long does it take to cure?

The recommended curing conditions (until water resistant) are:

1. @ Room temperature: 8 – 12 hours
2. @ 80 °C: two hours
3. @ 130 °C – 180 °C: one hour

The Solar Sharc® LITE coating is fully effective after 5 – 7 days' curing at room temperature.

What is the coverage of Sharc® Lite?

Based on a 2-micron thick coating, one Litre will cover approximately 144m^2.

How do I handle Sharc® Lite and is it safe?

All necessary handling & and safety information is contained within the MSDS which has been prepared in accordance with ECHA guidelines and complies with all relevant regulatory obligations. You should wear appropriate PPE equipment (refer to MSDS). Always open any container holding Solar Sharc® Lite in a well-ventilated area. Be mindful that Sharc® Lite contains ammonia which may be released when opened so ensure that your face is held away.

How do I prepare the substrate?

The substrate to be coated should be clean, grease free and dry. We recommend the following cleaning protocol:

- Use a soft brush to remove course surface debris. If the debris is 'caked' on the thorough wash to remove before initiating this step.
- Wash the surface with warm water (if possible) with an added surfactant to remove remaining dust and dirt.
- Wash the surface with clean water (warm if possible)
- Ensure that the surface is grease free. Any spots can be removed with a cloth impregnated with alcohol.
- Dry the surface ensuring that it is fully dry.
- -The glass surface must be fully dry before Sharc® Lite is applied.

How do I store Sharc® Lite?

Always store in a cool dry well-ventilated area. Protect against light and do not store above 25°C. The pot-life is 12 Months if stored in sealed containers up to 5 L. larger volumes than this will store for 3 months. Repeated opening of the container shortens the pot-life.

Technical

I would like to know more of the technical features of Sharc® Lite

The coating has been independently field tested. These independent tests verified the compliance with IEC61215 standard the equivalent of 25 years. The tests included the following:

- DH, Damp Heat: 1000 hours at 85C, 85% relative humidity
- TC, Thermal Cycles: 200 cycles from -40°C to 85°C
- HF, Humidity Freeze: 15 kWh of UV light, 50 thermal cycle -40°C to 85°C, 20 cycles humidity freeze -40°C to 85°C with humidity rate monitoring
- UK Tests carried out determined a roll of angle of 53° degrees for Sharc® Lite
- Contact angle testing is notoriously variable and dependent on many factors. The variability of CA measurements means a value of +\- 5 °is not uncommon. We would expect 95° and 102°

What about light transmittance?

Normal Glass 91-92%
Glass Coated with Sharc® Lite ~92%

What about DOI (Distinctness of Image)?

Normal Glass 96.5
Glass Coated with Sharc® Lite 97.1

Diiodomethane Contact Angle

Normal Glass 50°
Glass Coated with Solar Sharc® Lite 65° º

You highlight durability, but how long does the coating last?

Sharc® Lite has been independently lab & field tested according to all IEC 61215 standards and has passed. This standard is the equivalent of 25 years.

So if I apply Sharc® Lite will it last for 25 years?

IEC61215 is the only current standard that can used to measure the efficacy of the coating's capabilities. Local and global weather conditions can of course have an impact on the coating's durability as well as contributing factors such as cyclical cleaning regimes.

So will I need to re-apply Solar Sharc® Lite?

As with any type of coating, be it wax, paint, varnish environmental conditions over time will have a detrimental impact. Accordingly, we anticipate that re-application will be required at some point to ensure optimised performance.

Can Sharc® Lite save water and reduce O&M costs?

Yes, in a laboratory test two glass substrates (one coated with Sharc® Lite, the other uncoated) were exposed to an Arizona sand solution with 5 layers of sand deposited on top of each other, over a period of 20 hours at 4-hour intervals. In between each deposit, the substrates were baked at 45°C. (note that the sand did not fully adhere as part of the baking process to the Sharc® Lite coated substrate) They were then washed with deionised water, and the Sharc® Lite coated surface took less than half the amount of water to be fully cleaned. So in terms of an O&M perspective this demonstrates a saving in the use of water and of course associated labour. Here is a link to a video which demonstrates the test: https://solarsharc.com/solar-sharc-news/solar-sharc-release-new-anti-soiling-video/

Are there any harmful chemical added in Sharc® Lite coating? When the coated glass is washed with water and rain, will it dissolve?

Sharc® Lite comprises of silicon polymer dissolved in a conventional organic solvent (butyl acetate). Apart from flammable nature of the solvent and the liberation of a small amount of ammonia during the curing of the coating there are few hazards associated with Sharc® Lite. Once cured, the ceramic-like film does not dissolve in water (even when heated) or organic solvents.

Is Sharc® Lite shatter proof and able to contain broken glass fragments?

Unlikely, since the coating is very thin, if the glass shatters the coating is most likely to fail with the glass rather than acting as a laminating layer.

Thermal stability: Is Sharc® Lite able to withstand operating temperatures of 150-200°C?

Solar Sharc® Lite is stable to these temperatures for continuous operation for at least 168 hours.

What is the measurement for Sharc® Lite's adherence to glass?

On glass, adhesion is measured as 5B against standard ASTM D 3359-97.

Research and Development

What's your approach?

Continuing research & development is the foundation that underpins Sharc® Lite. We have adopted a collaborative approach to R&D by engaging and working with key enterprises. Ingenuity, invention and a unique materials by design pathway has facilitated the creation of Sharc® Lite.

What is Materials By Design?

The fundamentals that underpin the materials by design ethos are:
-Materials with new functions, features, capabilities and processing.
-Association of dissimilar materials.
-Adoption of processing techniques.
-Optimisation of process parameters.

MOQ (Minimum Order Quantities)

What is the minimum volume of Sharc® Lite I can order?

Sharc® Lite is a new technology, its manufacturing process is complex. Accordingly, to make Sharc® Lite commercially viable the minimum order requirement is 6 Litres. Detailed below is an example of the coverage attainable based on 10 Litres of Sharc® Lite.

Panel Watt Peak Capacity	Length	Width	SQ Metres	No Modules	Total SQ Metres	No Litres Required
330	2	1	**2**	720	**1440**	**10.0**

In this example we show the coverage based on 50 Litres of Sharc® Lite

Panel Watt Peak Capacity	Length	Width	SQ Metres	No Modules	Total SQ Metres	No Litres Required
330	2	1	**2**	3600	**7200**	**50.0**

What is the maximum volume of Sharc® Lite I can order?

Currently the maximum order is 1000 Litres of Sharc® Lite however, we do have supply chain capability to scale up for specific customer requirements.

What is your expected lead time?

Orders for 10 to 50 Litres our standard lead time is 2/4 weeks. For larger orders this will be increased, and we will confirm as part of our quotation process. We do retain smaller SKU's (stock kept units) so in certain instances we can ship volumes of 10 + Litres with a shorter lead in time.

What does Sharc® Lite cost?

This information is commercially sensitive. If you would like a quotation, please complete the RFQ (Request for Quotation Document) and we would be happy to provide you with a full quotation in confidence.

Do you provide samples? I would like to carry out a trial first

We do provide sample volumes of Solar Sharc® Lite. They are available in 1 Litre quantities.
Due to the high demand for sample volumes we do levy a charge for the sample and ask the shipping costs are met by the customer. Please note that we ship by both Air Freight and Road Freight depending on the end user location. The sample will be packed to comply with DG (Dangerous Goods) requirements.

How much does the sample cost?

The cost of the 1 Litre sample is € 265.00. The cost will be subject to VAT (where applicable) but excludes the cost of shipping, Dangerous Goods certification & any importation duty/taxes.

I would like a Sample what is the process?

Please complete the RFS (Request for Sample) application form and return to it to us. The form is available on our website. We will then provide full a quotation with pro-forma invoice. Please allow 7 days for a response. This allows our shipping company to identify the most competitive logistics quotation.

Can you Air Freight to any country?

Yes, in most cases. However, some countries do have restrictions that make air freight non-viable. We will be able to advise at the point of quotation.

Are there any other restrictions?

Yes, we can only ship to a commercial address not residential. We can only process the sample order once we have received full cleared payment in accordance with the terms of our Pro-forma invoice.

I would like to view the MSDS (Material Safety Data Sheet)

The MSDS for Sharc® Lite is available to download from the Solar Sharc® web site

I would like to view the TDS (Technical Data Sheet)

The TDS for Sharc® Lite will is available to download from the Solar Sharc® web site

Where can I find more information on Sharc® Lite and Solar Sharc®?

Please visit our website www.solarsharc.com for more information on Solar Sharc®