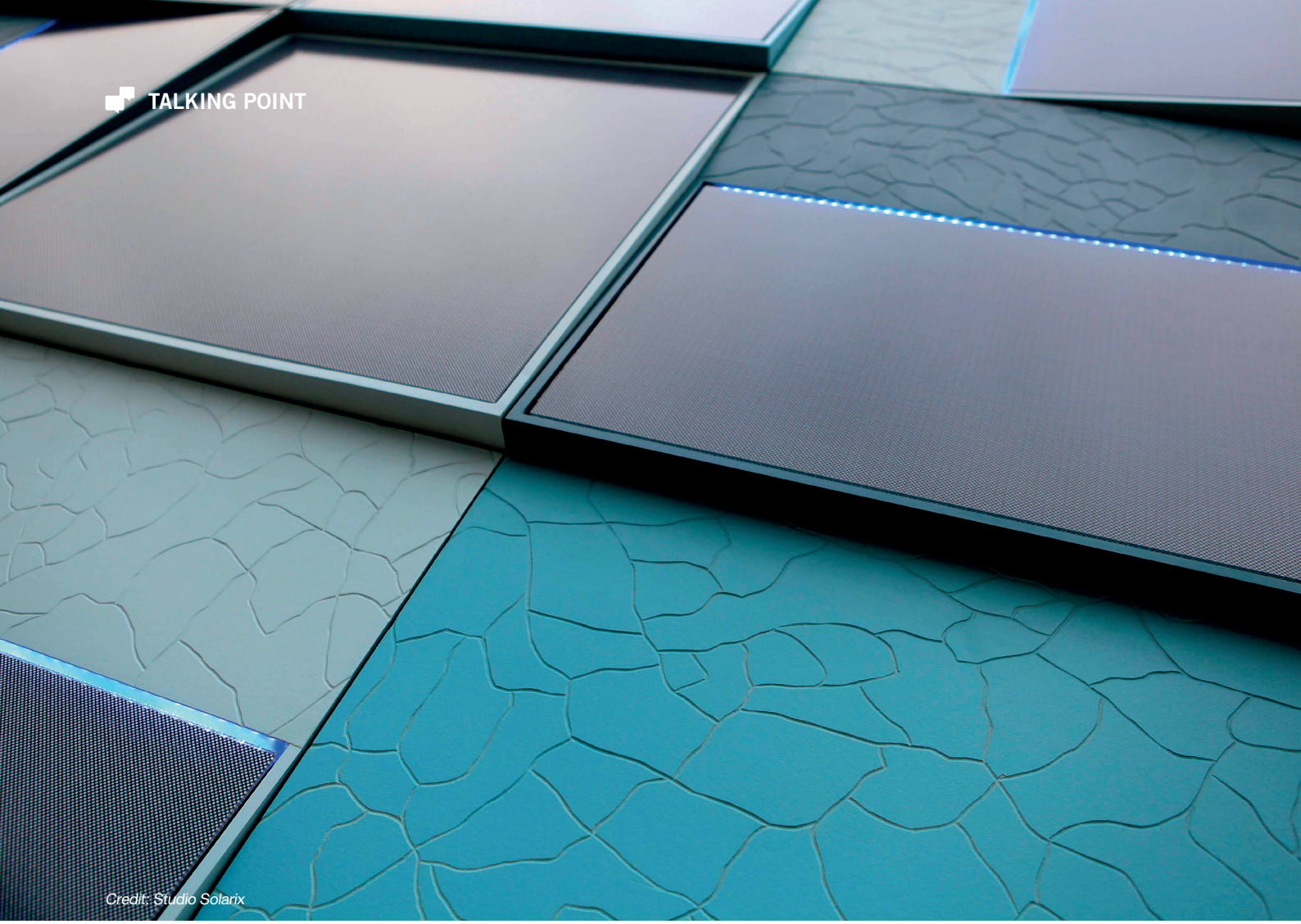


Credit: Studio Solarix

Standing out by blending in

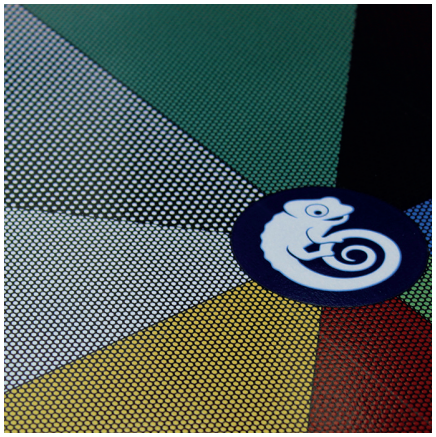
Words: Guust Verpaalen, CEO of Kameleon Solar

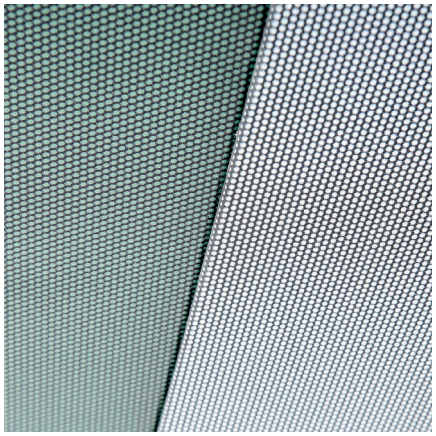
Guust Verpaalen

It's been three years since the founding of Kameleon Solar and I find myself, only now, writing the first in-depth article about our company. It's not that we've never had news worth sharing, as you will find, there have been plenty of milestones. Your first publication largely defines who you are as a company, and I prefer to share what we have accomplished rather than what we plan to.

Kameleon Solar was founded mid 2015 with the aim of producing custom-made flexible, glass/backsheet and glass/glass modules for BIPV and PIPV (product integrated photovoltaics). Like most solar companies, we focused on price, efficiency, on warranties. Production-wise, we focused on quality, costs, and efficiency. It didn't take long for us to find out why this standard solar manufacturing recipe simply doesn't work when you're dealing with architects, custom-made PV and BIPV façades, in general.

Our first issue was that we weren't the only ones to step up to the increasing demand of custom-made PV. Based in a high-wage country like the Netherlands, it is difficult to compete with countries that can offer the same services at a lower cost, if you don't





ColorBlast examples

The milkmaid of Vermeer in ColorBlast

have any unique qualities about your product. The fact that a solar panel comes in custom sizes does not change the fact that it looks like a solar panel and most architects, to put it plainly, think solar panels are ugly.

We needed to re-think our strategy. Our problem was simple, we were thinking 'solar' when we should have been thinking 'building'. Efficiencies, watt peaks, warranties, and all the usual USPs were put on a backburner and we started thinking in aesthetics, in square meters, in surface finishes and in terms of building materials. We needed to become an expert in color, to produce solar panels that didn't look like solar panels. Hence Kameleon Solar was truly born and, so too, our motto: standing out by blending in.

We started work on SwissINSO's Kromatix™ and LOF Solar's colored cells. Offering these color options in custom sizes made architects eager for more. A small color range was not enough. Architects are all about pushing boundaries so we needed to push boundaries, too.

We had been working on an idea for a color technology that seemed so counter to solar norms that it took a while before we started to consider its implementation. The idea revolved around the ceramic printing of glass to create a color and thereby consciously reducing the efficiency of a PV module. We started having trouble getting ahold of some of our standard color options and it became clear that the only way for us to reliably move forward was to develop our own color technology.

ColorBlast™

ColorBlast was developed around a sort of ceramic pixel principle. By printing small dots and leaving space around those dots for light to pass through, we could cover only a portion of the surface area whilst allowing the majority of light to pass through to the cells. This phenomenon is particularly popular for large advertisements on buildings, where windows and glass façades produce a larger image outside, but can still be seen through from the inside.

Ceramic printing is ideal for coloring a solar panel. First of all, the colors can be printed digitally which allows for an extremely precise and controllable coating. Secondly, ceramic inks maintain their color for more than 50 years, which is ideal for the building industry. The fact that the inks are tempered with the glass means you can pre-print the glass and use them in the existing production process without changing the color of the material. It's utterly scratch resistant and there are really no drawbacks on the durability of the module. Once you know how to control the distortion of colors and translate them correctly to the printer, it becomes easy to make new colors, too.

The challenge with colored modules, however, is that you create expectations. Orders start coming in asking for a specific color code and you have to be able to meet those expectations. This is where the fun begins.

How it works

The printed dots create an optical illusion

from a certain distance where they all seem to meld together. This only happens, however, if there aren't any disruptions in the design behind the dots, that is, the solar panel. Ceramic dot printing, then, only works where the whole module already appears to be a single color. Since solar cell material is, in general, overwhelmingly black, we would have to work with an entirely black module, ribbons and busbars included.

When you print dots over a black background, the even color that appears at a distance is very different from the color that is printed. Working with architects you quickly realize how vital it is to know how the color transforms and whether a given color is even feasible.

When you print dots, you cover a part of the surface area. Increasing the size of the dots increases this coverage while increasing the space between the dots decreases it. Brighter colors require more surface area to be printed whereas darker colors require less. Using a fixed coverage results in a fixed loss across colors, but far more interesting is calculating the minimum coverage needed to attain a specific color. This way, you can ensure that any color is always created with the highest efficiency and with the lowest coverage.

The efficiency loss of ColorBlast modules may be shocking in terms of the solar norms. Losses of 20% – 30% are common with mid-range colors, 10% – 15% in the darker range and up to 40% – 50% in the brighter range. Architects, however, see only an increase in power. A typical HPL façade element generates no energy but is available in an enormous range of colors and sizes. With ColorBlast, we can come close to the flexibility of such an element whilst also generating electricity at acceptable prices.

From past to present

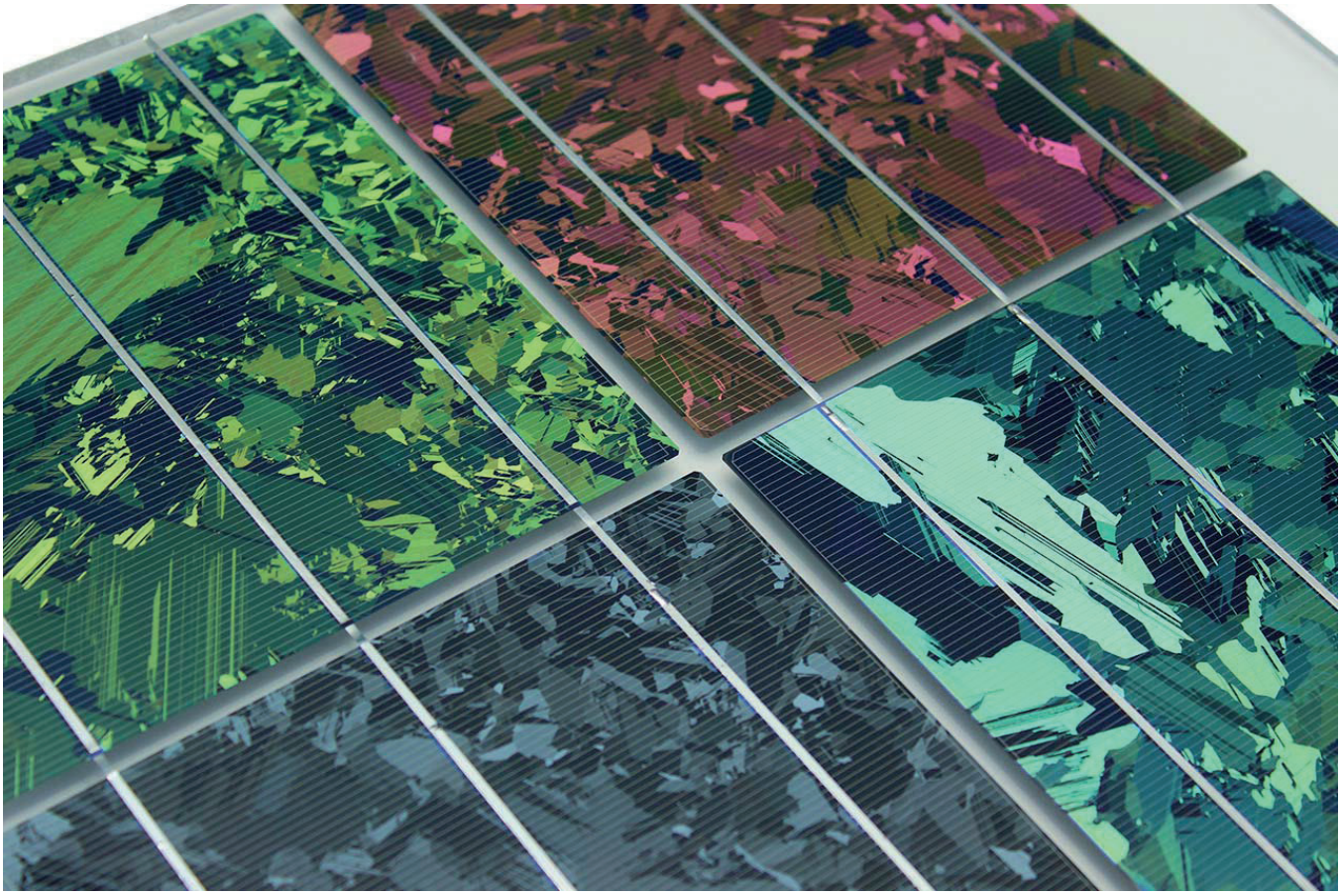
Those first two years of struggle were invaluable and utterly necessary for us to come to where we are now. We failed when we tried to convince architects that they wanted solar panels, or when we tried to convince the building industry to become more like the solar industry. Instead, we needed to convince ourselves to become a manufacturer of building products and not of photovoltaics.

Currently, we are capable of developing thousands of colors using more than three color technologies with the flexibility of design and durability that is expected of a façade element.

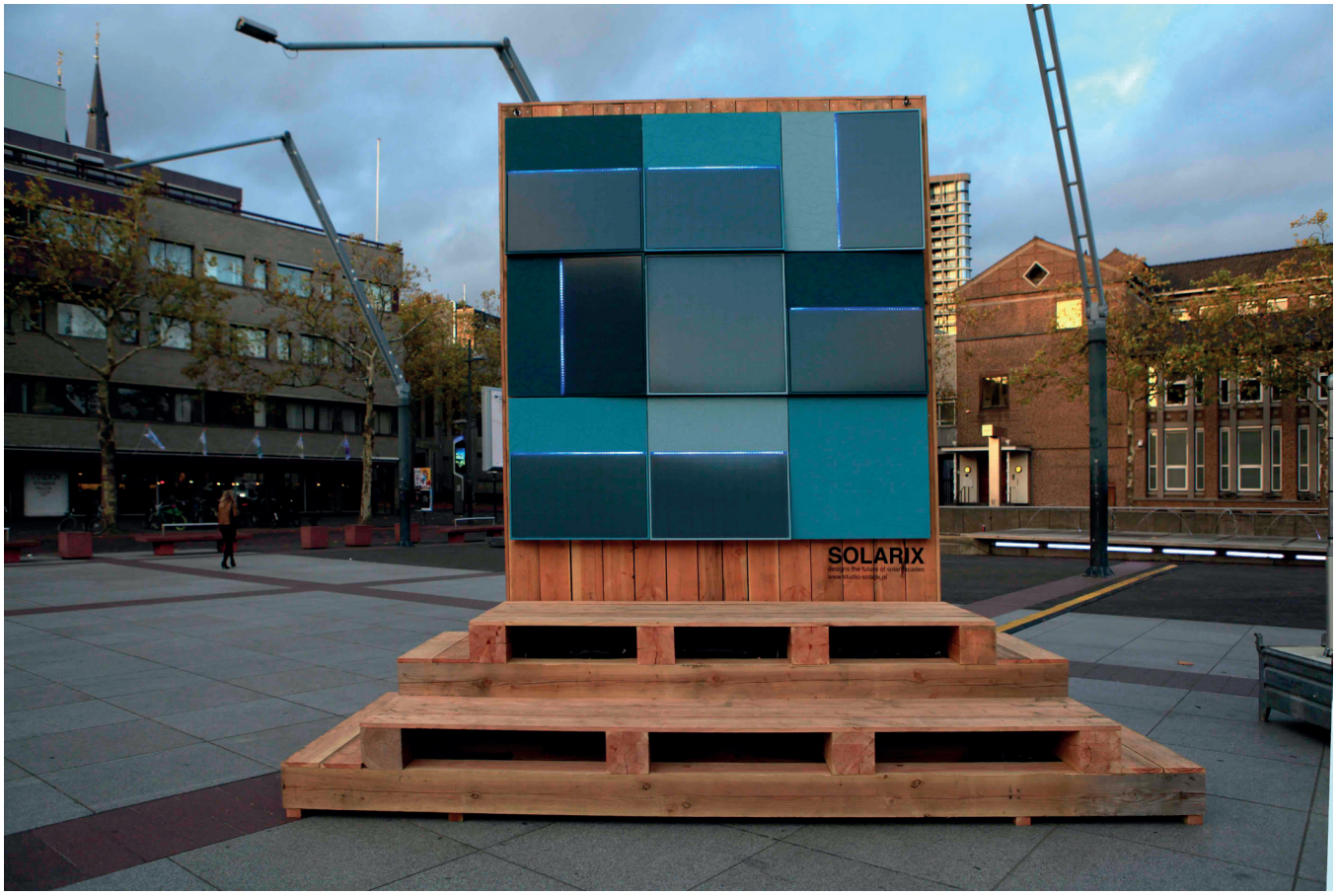
Last week we shipped out our first ColorBlast façade to London. It will be a barrier wall that separates a high-rise from the Eurostar line. Every day, passengers will zip by this façade and be oblivious to the fact that it generates solar energy. These 'Dusty Grey' panels blend in a little too well. As I write this article we are in production of our next project, a smart design façade here in the Netherlands.

Design façades

From the beginning of our color crusade, we have listened to architects and façade engineers. One of these partners is Studio Solarix, a Dutch architect and product designer who focuses on creating design solar façade products. Their mission is to create beautiful, smart façade elements that generate electricity and communicate information whilst contributing to a more sustainable urban environment.



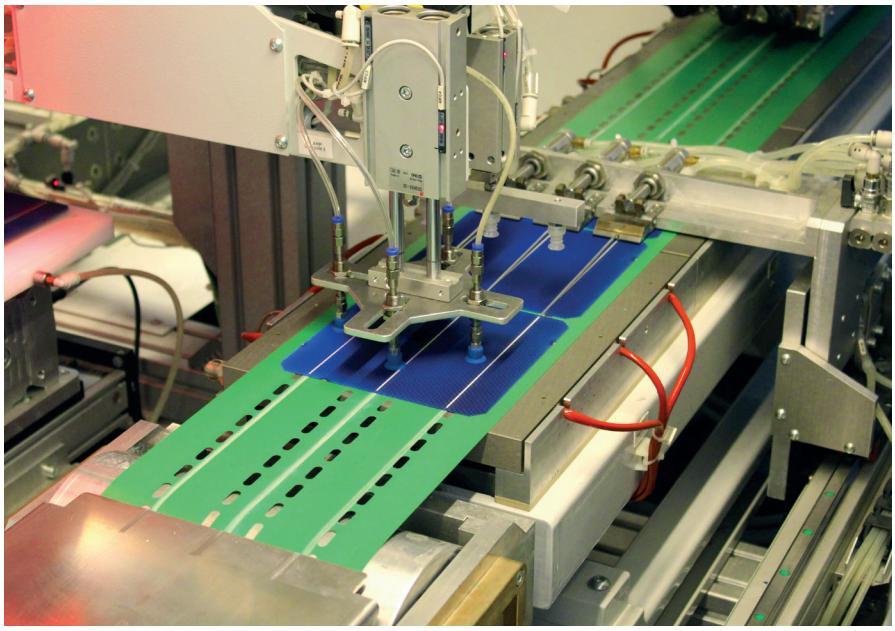
Example of LOF Cells



Credit: Studio Solarix

For the Dutch Design Week in 2017, the company presented the prototype of their Solarix product, a combination of a folded façade element, LED-lighting and colored PV modules; ColorBlast. A year later, the prototype has grown to a full-fledged product and will be installed as a renovation of the façade for a Dutch company, Kuijpers Installatie, in October this year.

The project, as well as being the first of its kind, highlights the complexity of BIPV façade projects. Intense communication is required between the architect (Studio Solarix), the façade engineer (Sorba), Kuijpers as the client and us, Kameleon Solar. Color-coordination across materials, the combination of different expansion coefficients, structural integrity all play their part and cannot be decided by a single party. This project underlines the impossibility of a one-size-fits all solution to BIPV façades and the importance of aesthetics over efficiency.



This project rightly suggests that making sustainability beautiful and smart increases its uptake more so than efficiency and price cuts. Particularly for the urban environment, where rooftops simply can't generate the required energy, this is the case. In October, the results of this combined effort can speak for itself with the first smart solar façade in the world.

Conclusion

We don't really see ourselves as a PV manufacturer anymore, at least not in the traditional sense. Our PV elements are a building material, they are functional in a very different sense than traditional modules. If the main goal of a project is to generate as much energy as possible at low costs, we kindly refuse it, pass it on; we're simply not the right company for this. If a project's focus is on smart building designs that must be beautiful and integrated, projects where sustainability and aesthetic value go hand-in-hand, that's where we stand out.

www.kameleonsolar.com