

Shedding light on the sustainable aspects of printed electronics

In an exclusive interview with OPE journal, Sophie Isabel Verstraelen, project manager at OE-A, presents the goals and current projects of the association's Working Group Sustainability

OPE journal: Ms Verstraelen, can you briefly introduce the OE-A Working Group Sustainability to our readers?

Sophie Isabel Verstraelen: As you know, OE-A (Organic and Printed Electronics Association) is the leading international industry association for the emerging technology of flexible, organic and printed electronics. We are representing the entire value chain and provide a unique platform for local and international cooperation between companies and research institutes. In order to build a stronger organic and printed electronics industry, OE-A covers several important as well as current topics and issues. Through a set of working groups, we enable and foster collaboration by all members. One of those working groups deals with sustainability.

As the organic and printed electronics industry moves into commercialisation, OE-A believes that sustainability is an increasingly important topic. Our Working Group Sustainability aims to identify and understand the sustainability benefits of organic and printed electronics technology, emphasising its contribution to a sustainable future in an open dialogue with key stakeholders, markets, regulators, and wider society.

It is critical that we examine our products and processes to identify how efficiently they are produced, how well we use the materials with which they are constructed, and how well they use power and other consumables when in operation. Finally, when these devices come to the end of their lifetime, we need to identify how they can be recycled or dealt with in a responsible, sustainable manner. Additionally, the OE-A aims to understand the key changes in regulations that will affect the industry in the short, medium and long term, and how they will harmonise with the benefits of organic and printed electronics. Moreover, we would like to provide the



Sophie Isabel Verstraelen

organic and printed electronics community with information, guidelines and methodologies that will allow members to better understand the sustainability of their own products and processes.

Our comprehension of sustainability is based on the principles of safety, economic success, fairness, respect & responsibility and includes the dimensions of society, ecology & economy. We comprehend sustainable action in terms of the definition of the Brundtland-Report and the definitions of the German "Rat für Nachhaltige Entwicklung".

As project manager, I am responsible for this working group. Our core group includes OE-A members from both industry and institute: Evonik Creavis – with the Working Group's spokesperson Michael Korell, COPT Center, PragmatIC and CPI. But there are more OE-A members who join our discussions, meetings and projects and provide their input. You can tell that their interest in this topic is growing!

OPE journal: The environmental factor is probably not the first thing that comes into mind when people talk about organic and printed electronics. Are we, in fact, a sustainable industry?

S.I. Verstraelen: Determining whether a certain printed electronics product or technology is sustainable or not is very challenging. This depends on many different factors, processes, applications, material use, etc. and requires thorough research. The main impact comes from the benefit generated in the application itself.

Here, printed electronics can help creating a more sustainable world. If you, for example, include temperature sensors on food packaging, you can reduce food waste. By integrating organic photovoltaics (OPV) into building facades you can generate renewable energy. OLED displays consume way less energy than traditional ones.

OPE journal: OE-A members in your working group came up with a 'generic printed electronics device' containing typical materials that are used in many production processes.

S.I. Verstraelen: The working group wanted to determine the impact of our technologies on the environment. When we contacted various recycling companies to ask them whether it would be easy for them to recycle printed electronics or products including printed electronics, they either were not familiar with the technology or could not tell whether it would be relevant for recycling at all. They wanted to get more information to be able to better understand what our products entail and what our addition to existing waste stream(s) would be.

As printed electronics has a very broad application range, it is a challenge to just pick one example. That is how we, the OE-A Sustain-



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ability Working Group, came up with the idea to develop (on paper) a 'generic device' which included various printed electronics aspects, and which is already – or soon will be – on the market.

Our goal was to develop a quantitative model for the impact of printed electronics in waste streams resulting from common applications. We decided upon a 'generic device' having a selection of functional subunits to cover various options of this technology: A battery-powered active sensor label, which periodically measures and stores a temperature, provides NFC communication capability and has 2 LED indicators, temperature sensor is part of the chip. It contains different components of printed electronics technologies. Such labels are already being used in luxury products such as special liquor, but we expect that these labels or tags will be soon applied en masse on, for example, milk packages – this of course increases the use of tags and therefore waste / recycling opportunities. As a next step we identified all the different materials that would be present in this generic device and made rough estimates of their possible amounts. All of this we did in small groups of OE-A members and later presented it during various meetings to a broader crowd to get feedback and input on our findings. We

then separated and analysed possible critical materials and created a document with possible waste streams for the discussion with the recycling experts.

We now have started to have conversations and meetings with, for example, the plastics and paper recycling industry to present and discuss our findings. We also had a meeting with various companies that develop recycling equipment. As a next step we are hoping to make a recycle trial-run with one of the companies to figure out how printed electronics can be recycled and be part of a circular economy. Further research remains to be done to be able to draw concrete conclusions and take the next steps. It is a complex matter, but we already made quite some progress.

OPE journal: Sectors such as the packaging industry are faced with an enormous backlash from society due to issues like ocean pollution and microplastics in soils and drinking water. Are members of our industry feeling some of this heat as well?

S.I. Verstraelen: We are well aware of the current plastics debate. That is also one of the reasons we are looking into this topic by, for example, talking with the plastic recycling industry and examining regulations. We will

furthermore be present at K 2019 in Düsseldorf (the international industry trade fair for plastics and rubber) where we will give a presentation on printed electronics and seek discussions with various stakeholders exploring and offering alternative solutions.

OPE journal: The Working Group Sustainability has also created a Regulatory Framework in order to raise awareness for international regulations and standards when it comes to waste management and material use. Can you talk about this part of your work?

S.I. Verstraelen: OE-A, together with its members, has set up a Regulatory Framework in order to make the printed electronics industry aware of international regulations and directives as well as standards in the areas of waste management and material use.

OE-A members need to take into account that governmental institutions, including e.g. the European Commission (EC), has put strict(er) legislations and requirements in place regarding material use and waste management. The objectives and targets set in the legislation have been key drivers to improve waste management, stimulate innovation in recycling, limit the use of landfilling, ban or limit certain material use and create incentives to change consumer as well as producer behaviour. OE-A and its members need to be aware of these legislations and need to be prepared to future changes and further restrictions. These regulations (in particular the ban on certain materials) can furthermore put a hold on the further development of certain products and technical applications. This can have a big impact on all participants of the process. The sooner the thin, organic, and large-area electronics (TOLAE) industry is aware of this, the sooner and easier products and productions processes can be improved and/or adapted. In order to inform its members, the OE-A Working Group Sustainability published the OE-A Sustainability Regulatory Framework. Set-up and created by OE-A members, this framework provides the TOLAE industry an overview of the international regulations and directives as well as certain standards. This "living" document (since these regulations and standards are subject to change as they are regularly being reviewed, updated or amended, and so is the Regulatory Framework) serves as an overview and a guidance. The Regulatory Framework is mapped out along the entire printed electronics life cycle –

from raw materials, equipment and components to distribution, user and disposal – to indicate which regulation or standard might affect which area. Each indicated regulation or standard is summarised on a separate ‘one pager’, including a link to more in depth information.

The overview of the Regulatory Framework is available to everyone, the complete document is exclusively available to OE-A members.

OPE journal: What are further fields of interest for this working group?

S.I. Verstraelen: Besides our participation at the K tradeshow in Düsseldorf, we are also collaborating with the VDMA department “Plastics & Rubber” and the VDMA Circular Economy Forum. Moreover, we support and partner with European Commission programmes and initiatives (e.g. SmartEES), where sustainability and the circular economy plays an important role in technology topics. Finally, we aim at broadening the network with the recycling industry and associations, as well as organising various meetings on the topic of sustainability, including interactive workshops and discussions.

Image sources: OE-A

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A meeting of the OE-A Working Group Sustainability



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