INNPAPER

2nd Newsletter

INNpaper newsletter

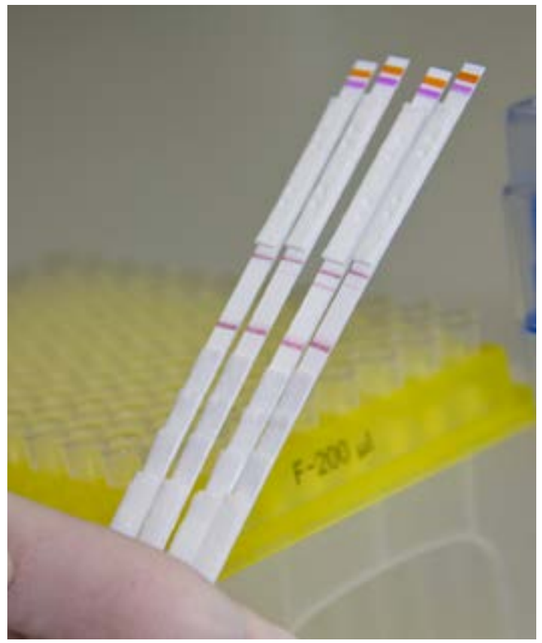
01 Foreword

Last December, the INNPAPER project overcame its second year. These last months have been very intense and the partners have worked hard in order to reach the milestones planned for this period. Thanks to these efforts, we have **covered our two objectives** for this period: having **paper with specific properties** we need —such as conductivity, tailor-made porosity, water-repellency or barrier properties against oxygen and moisture— and having **operative paper-based printed batteries, displays, NFC communication systems and sensors** targeting the use-cases of the project. While we will keep working to optimize these devices, our next step will be to integrate and **interconnect the different parts on a paper platform.** Both the layouts and the fabrication process sequences have been already defined, and we expect to have the first prototypes of a common platform (including battery, display and NFC communication system) by the end of February.

In addition to the technical aspects, I would like to remark the future **launch of an INNPAPER Open Call.** We want to extend the impact of the project by **finding new use-cases** through this contest for ideas. The application period will start on 1st April 2020, and our consortium will provide to the winner a detailed study about its use-case, allowing the company to make a step to be positioned in the field of green printed electronics.

Ana Viñuales
Project Coordinator

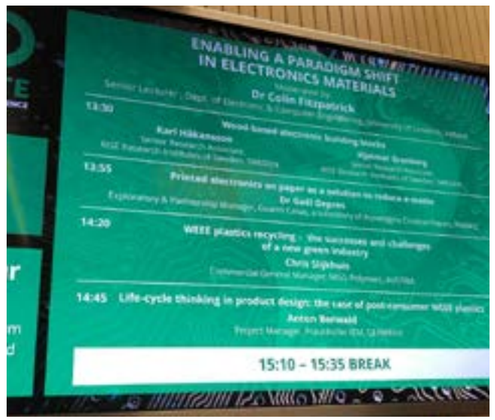
02 INNPAPER, showing results



One of the **main challenges** of our project lies on the **integration of biosensors** within our paper-based electronic platform. It's especially relevant for two of our study cases: caffeine and drug detectors, and the point-of-care tests for influenza and streptococcus. Our partners at Aalto developed a way to **use inkjet printing to improve** the behaviour of the microfluidic channels that guide the way of the liquid sample towards the printed sensors. Why inkjet? It is cheap, allows to print more intricated patterns, and it showed better results than other techniques. Read **the paper** for all the information!

Evaporation is another challenge when handling electrochemical tests on a paper platform. Sometimes it is good since it allows for better detection thresholds, while other times is something to be avoided. In any case, our coordinators at CIDETEC developed a **way to manage evaporation** **using adhesive tape.**

03 Communication
fostering commercial exploitation



Our Twitter profile keeps growing, with a community of over 2600 people following closely the project. And this rising interest has lead to several invitations to relevant events:

E-Waste World Conference: our partners from GuarroCasas presented **how paper-based electronics can help tackle the problem of electronic waste.** The event was organised in Frankfurt back in November and comprised nearly one hundred speakers from diverse industries: Dell, HP, Toyota… It was a great opportunity to establish contact with industry representatives that are interested in implementing new manufacturing processes and technologies that can reduce the amount of waste current electronics generate.

Forest-based sector Technology Platform: the conference took place the past 27th of November in Helsinki. Our partners of Aalto University and VTT Finland presented INNPAPER, focusing on **the latest results on cellulose-based sensors**. It was especially compelling to meet with the whole value chain of forest-dependant technologies: from suppliers of raw materials to final-product manufacturers.

We also attended other fairs and events such as European Congress of Clinical Microbiology & Infectious Diseases, LOPEC (Large-area, Organic & Printed Electronics Convention) and Santa Clara Printed Electronics 2019.

04 Open Call: kick-start your idea with us!

Our platform has a lot of potential that we will showcase by designing three use-cases. However, we want to explore other relevant applications!

During the first quarter of 2020 we are **launching an Open Call** to gather ideas for more applications of the INNPAPER technology. The ideas will be evaluated by a committee of our partners, to select the most promising one. The winner will get to **take the first steps with us:** we will assess the technical viability, design a manufacturing process flow and establish a clear roadmap to develop the idea up to TRL 7. This will be useful for those companies that are deciding whether to pass the idea onto a prototype or not. We will send a message through the mailing list when we open the applications, so if you know of someone who might be interested, send them **this link** so they can subscribe!

05 The latest trends in printed electronics

During this last year, we launched a new section on our website, where we **hand-pick the latest and more relevant news on printed and flexible electronics.** Among the most interesting news of 2019, we have selected:

Three sensors in one

Professor Xavier Crispin from Linköping University developed a sensor based on cellulose that is able to measure pressure, temperature and humidity at the same time. As the Internet of Things advances, **sensors** are becoming ubiquitous. Thus, **the more sustainable** these ever-present sensors become, **the better** for our planet!

Printing electronics onto delicate surfaces

Flexible electronics are characterised for using non-conventional substrates. A research team at Iowa State University and the Ames Laboratory have developed a **low-heat printing technique** that works on paper, gelatin and even on a rose petal. Printing electronics giving off less heat is crucial when using paper or other surfaces as a substrate.

Cellulose and spider web for a powerful material

Cellulose plays a central role when talking about new materials. It has a broad range of applications, and its chemical structure opens a huge number of possibilities. Our partners VTT and Aalto University published in September a paper with their new findings. By combining cellulose with spider silk, they have **developed a new material that outperforms most of today's synthetic and natural materials** by providing high strength and stiffness, combined with increased toughness.

Tying the loose ends for flexible electronics

The final frontier in printed and flexible electronics are transistors. They are the key pieces behind traditional electronics and have resisted the efforts to be integrated in paper and textile substrates. But a team at Tufts University has **developed a transistor made of linen thread** that could yield the first fully flexible transistors.

06 What's next?

Apart from our Open Call contest, 2020 is a promising year for our project. You can expect to see the first details on our three use-cases soon—we will be **trying out the first prototypes.** Also, we are hashing out the details of the Pilot Line for printed electronics. It will be the legacy of our project after it finishes and **will serve as a starting platform for experimental printed electronics across Europe**. As always, we will continue our innovation and research, so several papers and publications are coming out in the upcoming months. If you are interested, we will be showcasing the project at a joint workshop we are organising at LOPEC 2020, in Munich from the 24th to the 26th of March. Save the date and join us!

07 Contact

If you wish to have more information about the project **do not hesitate to contact us!**

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