Is it possible to make printed circuit boards more environmentally friendly by using renewable resources and the proven recycling process for paper, and thus also increase the efficiency of the e-waste recycling process?

Our mission

According to the United Nations e-waste report 2020 more than 53 Mio metric tons of e-waste were produced, increasing tendency. But only 17 percent were properly collected and recycled worldwide. In almost all electronic products, electronic printed circuit boards (PCB) are mounted, which contain sensors, chips, capacitors, resistors and so on. These PCB consist of a pre-impregnated fibre enforced epoxy polymer and circuitry based on copper.

Besides, metals such Pd, Ag, Ni, Au etc and additional polymers (solder stop masks, dielectrics etc.) are involved. Therefore, within a PCB a lot of different materials are used which causes difficulties for efficient recycling processes. The combination of low user acceptance of e-waste recycling and the difficulty to separate and recycle efficiently materials from electronic boards forms the motivation of CircEl-Paper:

We can do it! Paper-based and recyclable printed electronics to use well-established paper recycling processes and reduce the global e-waste mountain and for a functioning circular economy!

Funded by the European Union
Horizon Europe (HORIZON)

CircEl-Paper – Circular Economy Applied To Electronic Printed Circuit Boards Based On Paper
Grant No: 101070114
Topic ID: HORIZON-CL4-2021-DIGITAL-EMERGING-01-31
Contribution to the development of new concepts, designs and technologies in electronics to support and enable circular economy and sustainability.

Interested in CircEl-Paper? Contact us!

Gerhard Domann (project coordinator)
Tel. +49 931 4100-551
gerhard.domann@isc.fraunhofer.de

Dr. Daniela Collin (project management)
Tel. +49 931 4100-156
daniela.collin@isc.fraunhofer.de

Fraunhofer Institute for Silicate Research ISC
Neunerplatz 2
97082 Würzburg
www.circelpaper.eu

CircEl·Paper

CircEl-Paper

Recyclable paper-based printed electronics

CircEl-Paper Partners

The international consortium covers the entire value chain. A number of well-known research institutions, academic partners and production companies are involved:

- Fraunhofer Institute for Silicate Research ISC, Germany (project coordinator)
- F1 Paper, Fedrigoni Group, Italy/France
- Grenoble INP, Graduate School of Engineering and Management, University Grenoble Alpes, France.
- Joanneum Research GmbH, Austria
- Malmö Mönsterkort, Sweden
- RISE Research Institutes of Sweden
- VFP ink Technologies, France

How to participate

Visit the project's homepage, follow us on LinkedIn, or become member of our Industry Advisory Board.

Contribute...

- industrial product development experience,
- technical requirements,
- market needs,
- a little time and attention, once a year – or more often, if you like.

Benefit

- Stay informed about the ongoing project.
- Influence the alignment of the project goals for your own needs.
- Discuss with the work package leaders.
- Benefit from networking within the consortium partners
- Have a front row seat when it comes to using project results.

How to reach our goal

The general objective of CircEl-Paper is to close the loop for circular economy for reliable PCB / electronic substrate by using paper recycling and exploiting secondary raw and biobased materials.

Five steps

1. Development of paper as replacement for prepregs/core material for printed circuit boards.
2. Processing of conductive and dielectric materials based on secondary raw materials and base metals like Ni, Cu, Al, or bio-based materials for paper-based PCB.
3. Demonstration of reliable, optionally flexible electronics by assembled multilayer paper PCB.
4. Demonstration of usability of paper-based PCB in fields of consumer electronic, medical sensors and logistics.
5. Experimental and methodological development to adapt conventional paper recycling processes to the recycling of paper-based PCBs.

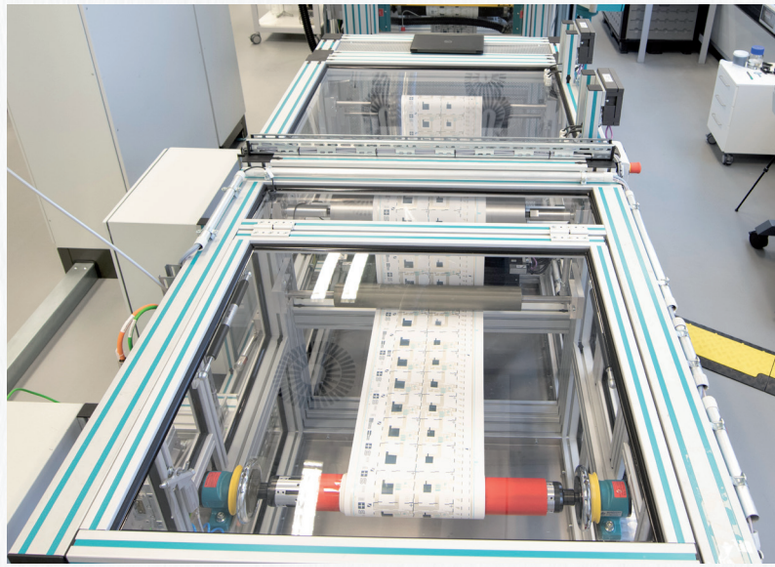
Three use cases

Making the technology's performance and adaptability tangible:

1. Medical sensors for measuring glucose level on skin surface
2. Packaging with time-temperature indicator (TTI) labels
3. Acoustic greeting cards playing music

[1] World Economic Forum, March 2023, The enormous opportunity of e-waste recycling; https://www.weforum.org/agenda/2023/03/the-enormous-opportunity-of-e-waste-recycling/.

CircEl·Paper



WWW » https://circelpaper.eu

LinkedIn » @CircelPaper

Email » circelpaper@isc.fraunhofer.de