Smart Hybrid Multimodal Printed Harvesting of Energy

SYMPHONY

Introduction:

The 21st century has been dominated by an ambient digitalization and the increasing use of electronics in everyday objects. Current IoT scenarios expect around 75 billion connected devices by 2025, and the powering of these devices by batteries will result in a considerable amount of potentially hazardous waste. Besides the predicted billions of smart objects require a proportional number of distributed and interconnected sensors that allow monitoring of the objects' inner state or the outer environment.

The spread of electronic systems in remote locations requires a change in power generation, making use of dislocated and disordered energy sources. A cost-efficient and environmentally friendly realization of energy harvesting (EH), however, is still a challenge, as the required input of functional material and electronic components in comparison to the energy output is high and often involves lead-based materials, manufacturing methods that consume high amounts of energy and costly assembly steps.

Project description:

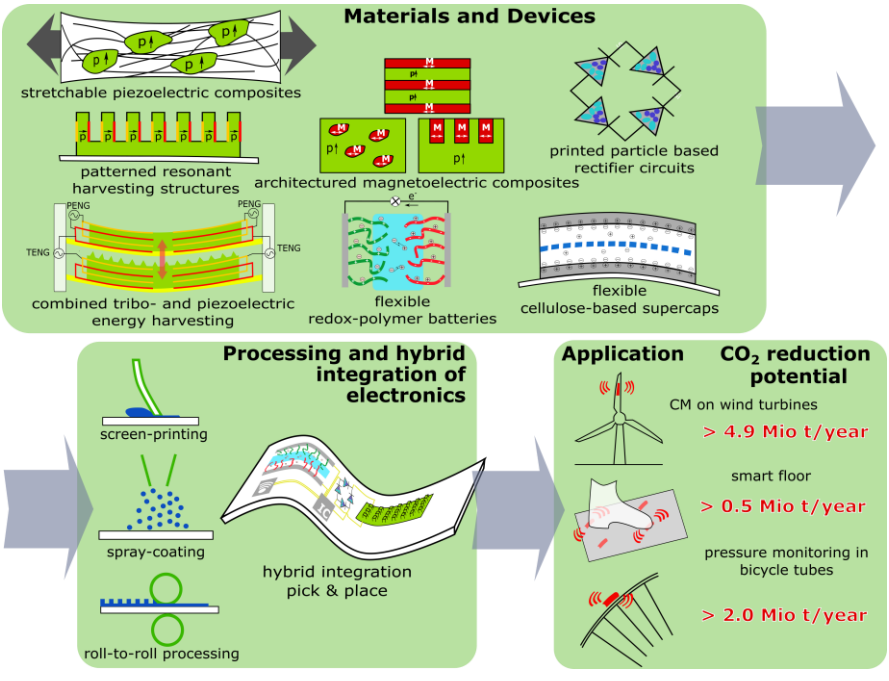

Figure 1: SYMPHONY project concept.

Project facts:

Start date: 01/05/2020

End date: 30/04/2024

Duration in months: 48

Project EU funding: 6.82M€

Grant Agreement n.: 862095

H2020 Topic: LC-NMBP-32-2019 Smart materials, systems and structures for energy harvesting (Research & Innovation Action)

Keywords:
Materials engineering, energy harvesting, piezoelectric, printed electronics, polymer batteries

Contacts:

Project Coordinator:
Dr. Jonas Groten
Joanneum Research (Austria)

Dissemination Manager:
Michèle Posch
Messfeld GmbH (Austria)

Email: symphony@joanneum.at

The SYMPHONY project is addressing all these challenges with the development of an innovative energy autonomous sensor system. The energy supply in this system is completely made of printed, recyclable, and non-toxic materials including the ferroelectric polymer P(VDF-TrFE), printable Si-based rectifiers, redox polymer batteries and cellulose-based supercapacitors.

The SYMPHONY project develops cost effective and scalable methods to print these materials on flexible films and to combine them with energy efficient electronics and sensor technologies. With the scalable and low-cost processing in combination with optimized ICs for energy harvesting the SYMPHONY project strives the goal of a specific cost below 1€/mW harvesting power.

Impact:

The SYMPHONY project delivers an energy supply platform for the powering of wireless sensors/sensor nodes for monitoring remote or difficult-to-access locations. **The printed technology can be integrated cost effectively in stretchable and flexible devices, representing a huge potential for usage in a wide range of further IoT-supported applications.**

The SYMPHONY energy autonomous sensor system will provide functionalities such as Condition Monitoring, Predictive Maintenance or Energy Management in 3 application areas: renewable energy generation, room heating/cooling and mobility.

The SYMPHONY solution will significantly reduce CO_2 emissions by increasing the lifetime of wind turbines, making room heating/cooling more efficient, through presence and motion tracking smart floors and decreasing the energy consumption in e-bikes, through remote tube pressure control.

Multidisciplinary expertise:

The project includes 13 top EU innovation performers (researchers and companies) from 4 European countries.

Research institutes and academic partners (JOR, ISC, RISE, PCCL, LiU, IL) will cooperate with chemical industries (ARK, SEM) to develop the new SYMPHONY materials (magnetoelectric, tribo- and piezoelectric energy harvesting composites and patterned structures) and devices (polymer batteries, rectifiers and cellulose based supercapacitors). Similarly, research institutes and industrial partners (JOR, ISC, RISE, IL, ARK, SEM) will share their knowledge for the development of low-cost and scalable processes for materials synthesis, functional printing and patterning.

The hybrid integration for the manufacturing of the SYMPHONY energy autonomous sensor system will be carried out by RISE integrating the solution processable materials with energy efficient electronics developed by IFAT and WUE. The Life Cycle Analysis (RISE) is covering the different stages of the project (from materials to process development, integration and manufacturing of final products and testing). Finally, the manufacturing of the three SYMPHONY applications will benefit from the expertise of the partners JOR/Parador, EOL, MES, and TUB.

Consortium:

JOANNEUM RESEARCH MATERIALS	JOR
Fraunhofer ISC	ISC
RISE	RISE
iL INNOVATION LAB thinking works	IL
eologix sensor technology	EOL
ARKEMA INNOVATIVE CHEMISTRY	ARK
Messfeld Kompetenz in Condition Monitoring	MES
PCCL Polymer Competence Center Leoben	PCCL
tubolito LIGHT WEIGHT TUBES	TUB
LINKÖPING UNIVERSITY	LiU
SEMPERIT	SEM
infineon	IFAT
WÜRTH ELEKTRONIK	WUE

Website:

www.symphony-energy.eu

The project SYMPHONY receives funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 862095.