Deliverable

WP5 – Dissemination and exploitation

D5.4 Project Newsletter (3)

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Name	Position in project	Organisation	Date	Visa
Lucia Petti	Coordinator	CNR	30/09/2021	OK
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Jean Herisson	Project Management Officer	AYMING	30/09/2021	OK
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Table of content

Executive summary

1 Executive summary

1.1. Description of the deliverable content and purpose

Deliverable 5.4 is related to the creation of the third PULSE-COM newsletter that will be widely disseminated through different channels (website, social media, mailing list…).

The newsletter is attached to this report and also accessible through this link: https://mailchi.mp/6aa3adbcf14e/6ns78x3rn8-5184508
Only short sections of each articles are provided for that newsletter. The full length is provided on the news section of the official PULSE-COM website (https://www.pulsecom-h2020.eu/news/). Individual links are provided after each article to easily reach them.

In this newsletter a presentation of some technical advancements operated by partners are presented.

1.2. Brief description of the state of the art and the innovation breakthroughs

N/A

1.3. Corrective action (if relevant)

N/A

1.4. IPR issues (if relevant)

N/A

Deliverable report

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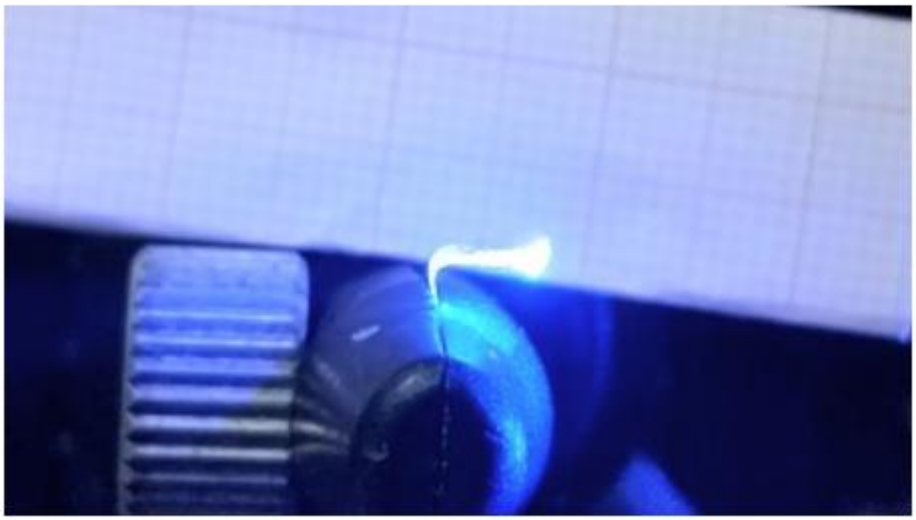
Dear PULSE-COM follower,

It's been now 22 months that the PULSE-COM project has been launched and we entered in our second period. After a positive evaluation by the European Commission we are now working actively to reach our goals. You will discover some of our main advancements, among others: a joint patent, a summer school and some materials' optimizations.

Before letting you discover some of our progresses, let us just recall the goal and approach of PULSE-COM project. It aims at realizing a radical new class of photo-activated devices changing the current paradigms in the frame of a new area of investigation such as photo-activated piezoelectricity. It will explore and enhance properties of novel, cost-effective photo-mobile polymer (PMP) films combined with modern lead-free piezoelectric (PZL) to produce new composite materials predestined for a wide range of applications never before considered.

We hope that the following news from all PULSE-COM partners will be of interest for you!

Synthesis of self-oscillating photo mobile polymer films

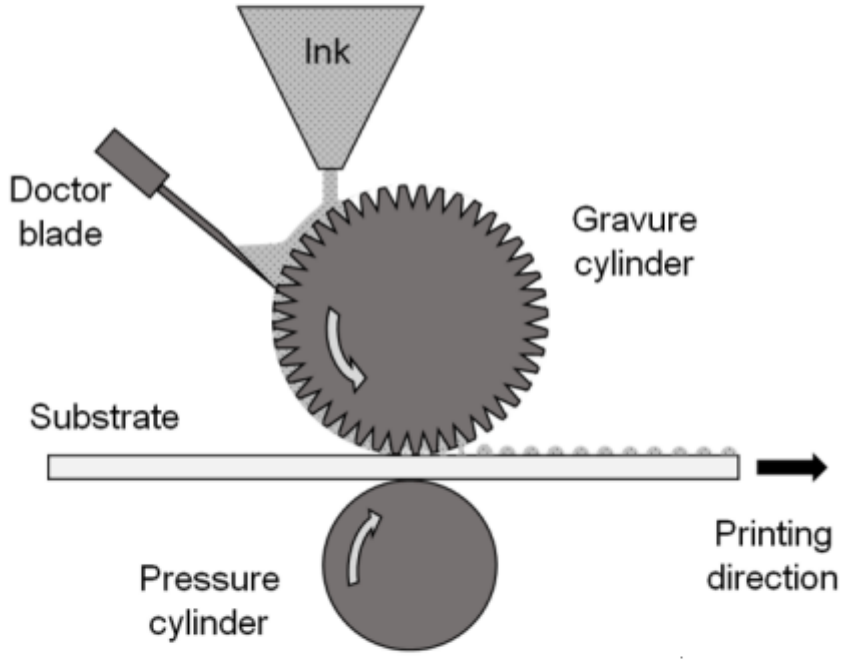


Self-vibrating PMP during continuous irradiation with polarized light.

CNR successfully prepared a Photo-Mobile Polymer (PMP) film self-vibrating while exposed to polarized light. In brief, the protocol of preparation involves the preparation of polymer coated glass slides that will be used as minireactors for the polymerization. The mix used is introduced in the cells by capillarity and the polymerization started with the use of UV light (390-400 nm). The films prepared are cheaper, higher performing and easily upgradable of previous formulations.

For more information, please click here.

New vacuum-free and low cost method to deposit ZnO seed layers for the development of flexible piezoelectric transducers in PULSE-COM project

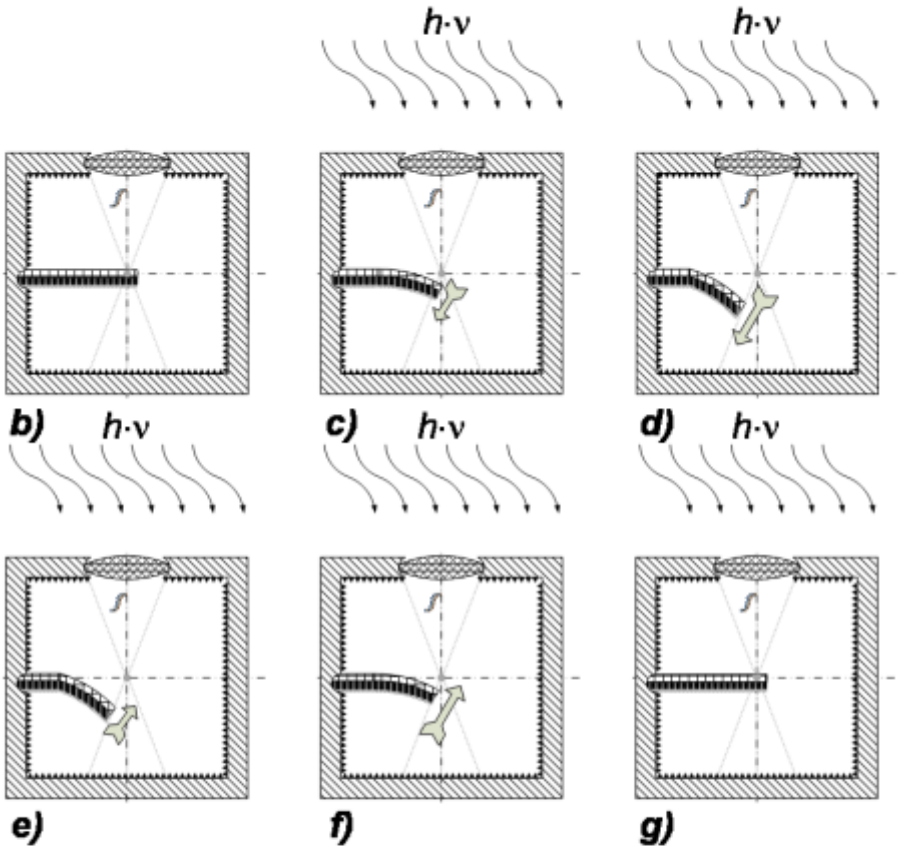


Gravure printing method.

Piezo-semiconducting zinc oxide (ZnO) nanowires (NWs) are excellent candidates for the fabrication of energy harvesters, mechanical sensors, piezotronic and piezophototronic devices. They are grown typically from thin seed layers. Low temperature fabrication methods are required for their integration on flexible substrates. Vacuum-free methods of deposition will eventually reduce their fabrication cost. In PULSE-COM, within a strong collaboration of ENEA and UGA partners, gravure printing method has been used to deposit thin layers of ZnO on flexible substrates.

For more information, please clik here.

PULSE-COM has produced its first collaborative patent

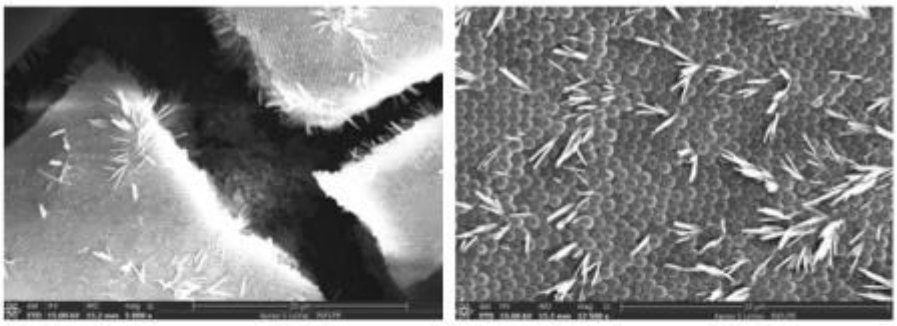


Mode of operation of Photo-Piezoelectric energy generator of electrical energy from light energy

We are proud to announce that collaborative work of the PULSE-COM team resulted in a European Patent submission. The patent EP21461595.7 entitled: "*Photo-Piezoelectric Energy Generator of Electrical Energy from Light Energy*" was filed in September 2021. The patent protects the topology of harvester which uses PMP/PZL bilayer's cyclic bending to convert light into electricity.

For more information, please click here.

Optimization of the PMP through surface treatment

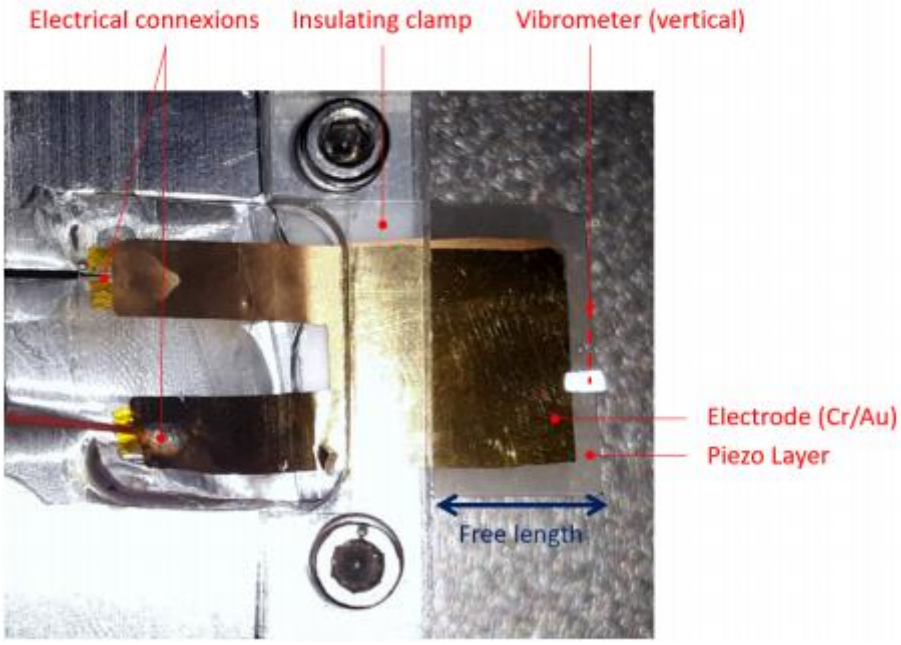


Thin ordered films on ZA4 PMP

By repeating the experiments made on first PMP with ZA4 PMP, we saw that some important PMP characteristics were changed, thus the embossing was no longer possible. So, another approach was tried. First, we tried to form a thick, ordered film of sub-micron spheres onto the membrane and we successfully performed this for a colloidal solution. By decreasing the colloid concentration, a compact and relatively thin ordered film was formed.
By using a self-assembly method, a micro-structured single layer of SiO_2 spheres was formed onto the ZA4 PMP's surface.

For more information, please click here.

Evaluation of the d31 piezoelectric coefficient using buckling analysis techniques



Piezoelectric device using PiezoTech® PVDF material manufactured in collaboration with UGA, cantilever configuration

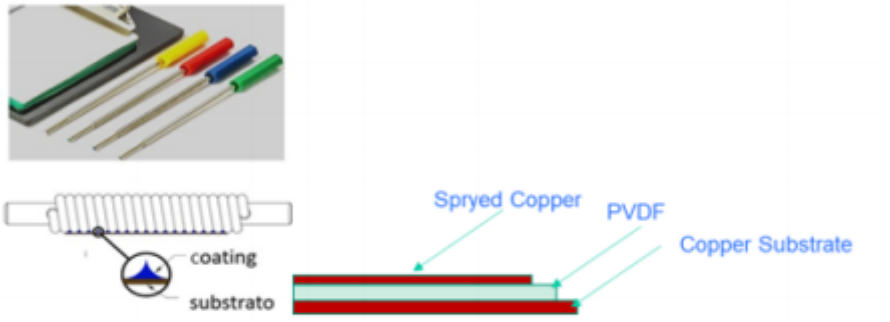
In PULSE-COM project are investigated several piezoelectric elements to be integrated on the photomobile-polymer (PMP). The two main functions of the piezoelectric layer are:

- Sensing,
- Energy harvesting,

Indeed, when the PMP bends due to light excitation, it is expected the mechanical deformation is converted into electricity by the mean of the direct piezoelectric effect.
To measure the performances of the novel piezoelectric elements developed in PULSE-COM, such as the d_{31} piezoelectric coefficient, we created a test bench based on the buckling analysis technique. To validate the method, we tested the bench with a known piezoelectric device, to compare the measured d_{31} with the manufacturer's data.

For more information, please clik here.

PVDF based Piezoelectric devices on thin copper bendable substrate: preliminary tests



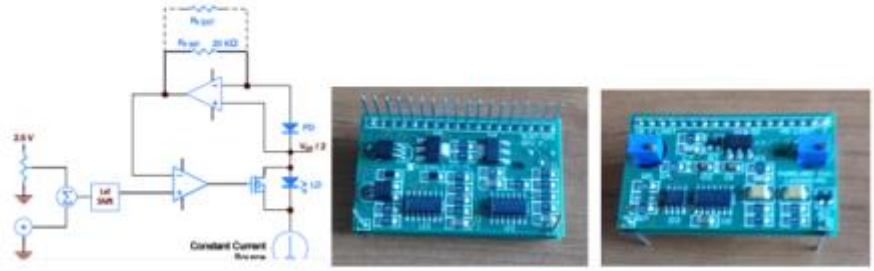
(left) bar coating process. (right) Samples scheme for the full Piezo-devices.

PVDF based Piezoelectric (PZL) devices were fabricated to realize a very thin and simple bendable device to be integrated with the PMP layers. In this way the PMP / PZL structure, with the use of the copper foil, will be able to integrate easily and will be able to dissipate the heat more simply if the PMP is irradiated with high intensity light.
PZL devices fabrication:

- Active layer: bilayer (~ 7 µm) of PVDF + 10 wt% $BaTiO_3$ deposited onto Copper foil (10 µm) by bar coating
- Top electrode: sprayed silver coated copper compound

For more information, please click here.

Reconfigurable Optical Networks



a) The simplified block diagram of Driver b) Driver module front-end and back-end

Reconfigurable Optical Networks will be developed by SITEX 45 based on reconfigurable optical devices implementation into networks with new tunable and switchable functionalities by means of optical control. Between several optics devices with more specific functionalities we are working to perform the photonic devices with the specific functions like wavelength selector, multiplexer/de-multiplexer as well as even the spectrometer.
So having even each with other seems to have the closed operation, but each of them is different in order to meet their specific working requirements. Because there are a greater diversity of works performed for development of each of application nominated as above could be selected only few of works and results for a short information as below: Due of very short space more results about 2D Photonic Crystals performed into photonic devices could be displayed by the next Newsletter *Wavelength selector*. Because the integrated hardware system development is essentially has continued the works for finalisation of set-up of wavelength selector (schematic drawing. of proposal) as well as for proof of concept validation. To be realized the set-up of workable wavelength selector had to be performed the design/development and manufacturing works of specific subsystems/electronic modules with further integration into optical system. The light sources selected to be used for our application are two types of laser diodes for two different wavelength as 635 nm and respectively 515 nm . For optimal operation of selected light sources had to develop the Driver for Laser diode with analog modulation. The driver

system uses the internal monitor photodiode on most low power diode lasers for feedback when operating in the Constant Power Mode.

For more information, please click here.

1st edition of a school on smart materials for opto-electronic Applications

Attendees of the first PULSE-COM short school

At the beginning of this month, a two-days remote school had been organised by the consortium on smart materials for opto-electronic applications. The aim was to bring to the attendees the concepts and basic working principles on Smart Materials Technologies from experts in the fields coming from both academy and industries. 16 lectures had been given for addressing complete understanding of how the Smart Materials have been exploited for achieving recent significant results in ground-breaking research of PULSE-COM as well as in applied sciences by investigators working in the PULSE-COM consortium.

For more information, please click here

https://www.pulsecom-h2020.eu/

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