Deliverable

WP5 – Dissemination and exploitation

D5.5 Project Newsletter (4)

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Table of content

Executive summary

1 Executive summary

1.1. Description of the deliverable content and purpose

Deliverable 5.5 is related to the creation of the fourth 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/7203d881a1cc/6ns78x3rn8-13847536?e=e8145acf5e
Only short sections of each article 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, the following points are addressed:

- Presentation of some technical advancements operated by partners;
- General news about the project.

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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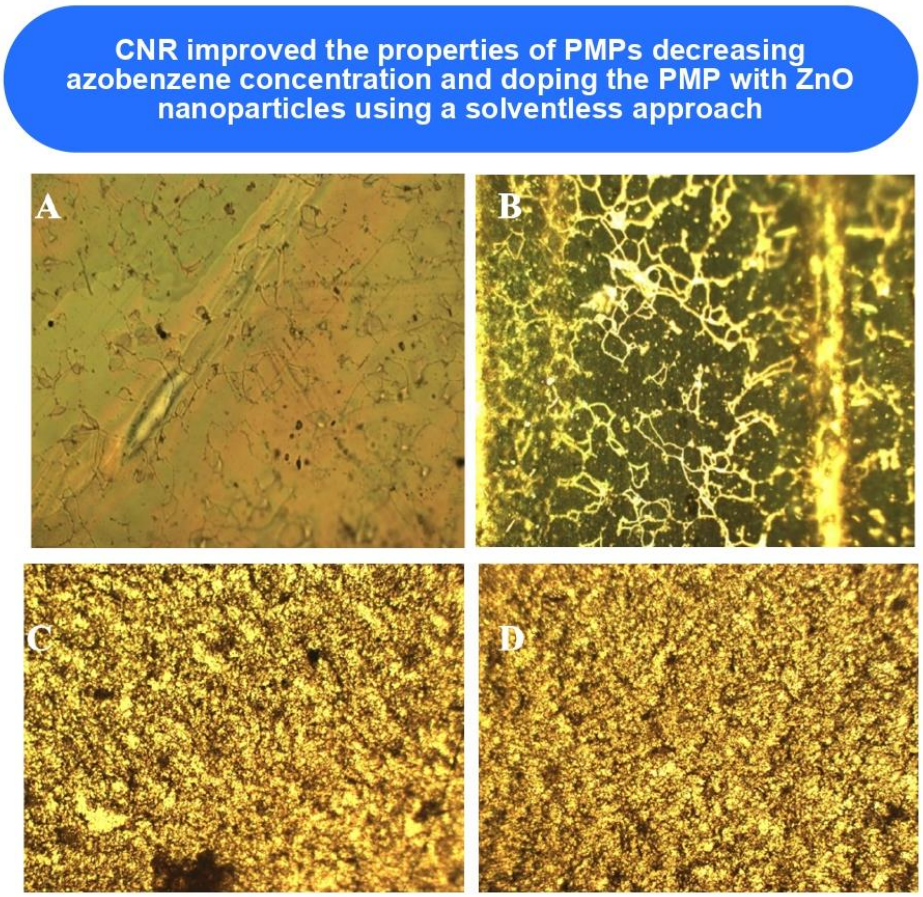
Dear PULSE-COM follower,

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!

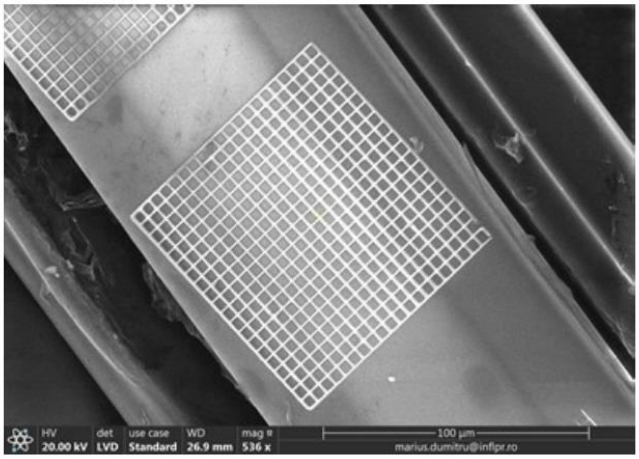


PMP observed using polarized microscopy Azo-LC-PMP (A, B) and doped PMP (C, D) samples tilted of 45 degrees (A, C) or parallel to one of the two polarizers (B, D)

CNR improved the properties of PMPs decreasing azobenzene concentration and doping the PMP with ZnO nanoparticles using a solventless approach.
The PMPs when doped lost their ability to rotate the polarized light but improved their bending capabilities and mechanical properties. In fact the doped material could bend more as compared with control when irradiated with laser light. Furthermore, the ZnO nanoparticles could improve the material ability to store energy indicating that the sample had higher strength as compared to control. Interestingly, such doped material could self-vibrate when stimulated with laser light at 457 nm even if the nematic configuration was apparently disturbed by the nanoparticles.

For more information, please click here.

Laser Direct Writing via Two Photon Polymerization

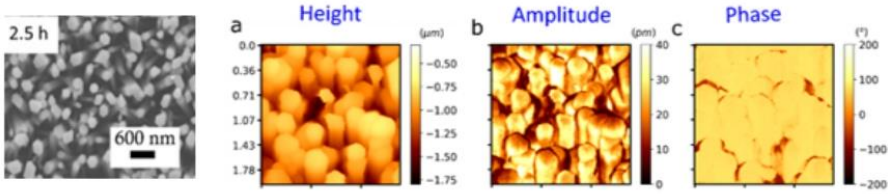


Optimal diffraction grating fabricated via 3DL on the surface of mechanically produced slits in an optical fiber.

Laser Direct Writing via Two Photon Polymerization (LDW via TPP), also known as 3D Lithography (3DL), is a method of obtaining structures with sub-micrometric features (lateral features down to 90 nm) using LDW. The key element is the two-photon absorption and the transverse Gaussian intensity profile of the incident laser beam. Irradiation of the used photoresist initiates a chemical reaction that results in polymeric chains that result in solid microstructures. Generally, a photoresist appropriate for 3DL is comprised of 3 main components: monomer, photoinitiator and solvent. During the irradiation process, the photoinitiator molecules are ionized, resulting in free radicals (molecules with active terminations). These ionized molecules react with monomer molecules and initiate a chain polymerization process.

For more information, please click here.

A new strategy to improve the measurements and analysis at the nanoscale using Piezoresponse Force Microscopy



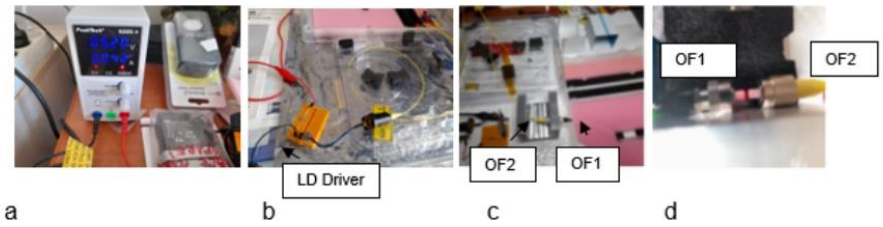
SEM images of ZnO NWs grown on sintered ZnO seed layer on ITO/PET flexible substrate, (b) Topography (c) PFM amplitude and (d) phase distributions on ZnO grown PET-ITO after 1h annealing of the seed layer deposited by gravure printing.

Piezoelectric and semiconducting zinc oxide nanowires are excellent candidates for the fabrication of energy harvesters, mechanical sensors, piezotronic and piezophototronic devices. Understanding the interplay between piezoelectricity and semiconductor physics is fundamental to enhancing the performance of these devices.

A new strategy to improve the measurements and analysis at the nanoscale have been developed. The stragegy is based on piezoresponse force microscopy and was applied to study the piezoelectric performances of ZnO NWs vertically grown on seed layers deposited by gravure printing onto flexible substrates.

For more information, please click here.

Optical Fibers alignement

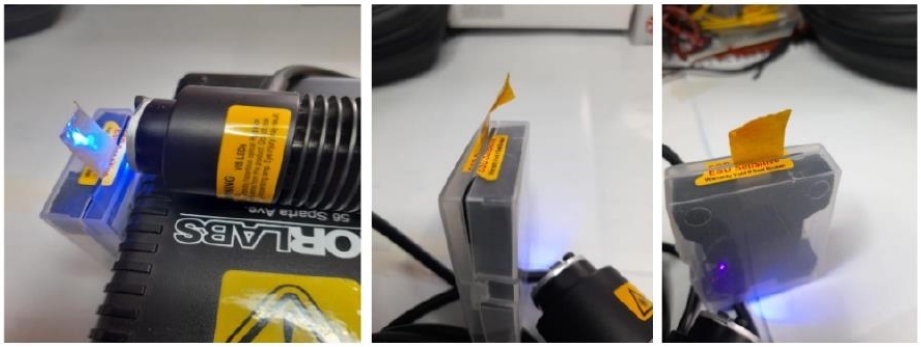


The testing bench a) the supplying unit b) the LD driver interconnected module c) the mechanical alignment tool d) the connectors alignment for OF1/OF2. In order to maximize the light value transmission between both optical fibers we have used for OF`s alignment by the coupler.

The Optical Fibers (OF`s) alignment is one of very important operation to perform the optimal parameters of light beam as generated by a light source as for our project PULSE-COM works. For the alignment procedure first experiments used the mechanical support concept in house to align the OF (n°1), a single mode fiber with an FC/PC connector at one end and LD as light source at the other of which beam generated with a second OF (n°2) with same characteristics of OF but having the refractive network at one end and a connector type FC/PC at the other end.

For more information, please click here.

The bending experiments of PMP samples by several technical solutions

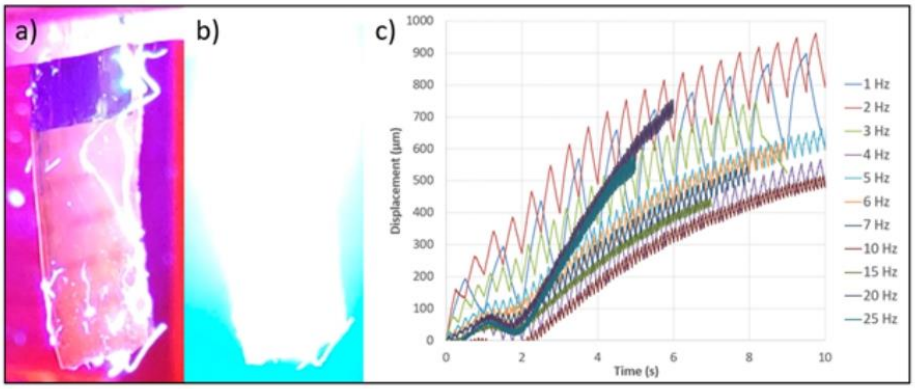


Example of bending PMP sample with a high power LED

For experiments of bending process of PMP samples used different radiation sources as (a) High Power LED, (b) Laser Diode Red integrated module, (c) Halogen light source.
The experimental results of several light sources for bending the PMP samples will give the possibility to select the most valuable technical solution for bending/relaxing operations of PMP samples to be further implemented into wave selector/spectrometer devices under development and manufacturing works. We considered the individual light sources parameters, dimensional characteristics and assembling requirements, and weight of the simple supply unit as the main factors to select the most suitable light sources.
The selected solution will allow us to apply it for further development of instrumentation for spectral analysis on the specific instrumentation market.

For more information, please click here.

Azo-PMP: fast and adapted reactivity for optical micro-switch application



PMP-Azo sample tip displacement measurements under UV light (a) and blue light (b) exposure alternance

Photomobile polymers composed of azobenzene molecules (PMP-Azo) possess specific properties for photomechanical conversion. The mechanical deformation of these devices is based on the photoisomerization principle. This phenomenon is coupled with thermomechanical deformation. Indeed, the PMP-Azo sample is heated because of the light absorbance properties of the material.

The preliminary tests confirms the possibility of the PMP-Azo to be integrated in an optical micro-switch application. The sample is indeed covered with copper which gives it interesting electrical properties that must be further investigated.

For more information, please clik here.

2nd Summer School on Smart Materials for Opto-Electronic Applications

Picture of the speakers of the 2nd Summer School on Smart Materials for Opto-Electronic Application.

The 12th and 13th of September 2022, the PULSE-COM project organised the 2nd edition of the Summer School on Smart Materials for Opto-Electronic Applications in hybrid format. Thanks to the talented and experienced speakers who intervene this edition had been a real success!

This event, sponsored by ThermoFisher Scientific and Acal bfi gathered more than 70 people. Part of them where physically present in Cetraro while most of the students were online.

If you miss the summer school, all the content presented during that 2 days is now shared in video format on our website, and accessible by clicking here: https://www.pulsecom-h2020.eu/2nd-short-school-on-smart-materials-for-opto-electronic-applications/

For more information, please click here.

New funding for some PULSE-COM partners

EUREKA! TT s.r.l. logo

EUREKA! TT s.r.l., the investment company of "Eureka! Fund I – Technology Transfer" that finances Proof-of-Concept projects of Italian universities and research centers, has chosen to fund through an innovation contract the CNR together with the ENEA.
The Proof of Concept project named ALICE (Actuators based on LIght sensitive CompositE) targets the development of smart photomobile polymer-based materials through printing processes (3D/4D) and uses them as actuators to realize solar trackers in photovoltaic, solar concentrator and thermodynamic fields.
Starting from two International patents the project aims to propose a new class of proof of concept systems to revolutionize the markets and changing the current paradigms in the fields of smart devices, robotics, sensors and actuators.

For more information, please click here.

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

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