



LAser induced synthesis of polymeric nanocomposite materials and development of **Micro-Patterned** hybrid light emitting diodes (LED) and transistors (LET) – **LAMP**

The European project : materials, laser structuring for new OLED and OLET manufacturing

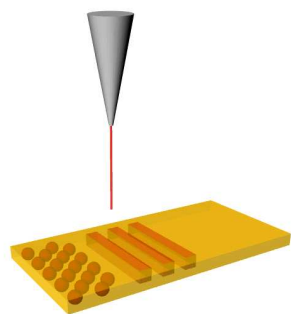
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Francesco Antolini – ENEA –

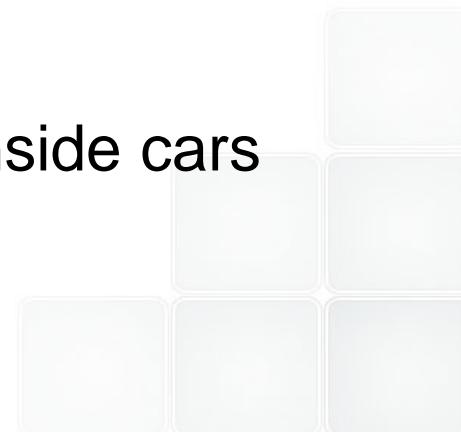
Rome 12 April 2013



Main goal: Development of a laser patterned organic light emitting diode/transistor



Realisation of small icons and courtesy light inside cars



The LAMP project stems from an ENEA patent describing the realisation of nano-structured materials by means of direct writing in specific regions of a material (Pat. N° MI2006A001156 Antolini, Trave, Esposito, Tapfer) in collaboration with ENEA Centre of Brindisi.



This methodology has been applied for OLED/OLET manufacturing. However, being a quite general procedure, can be extended to other applications.

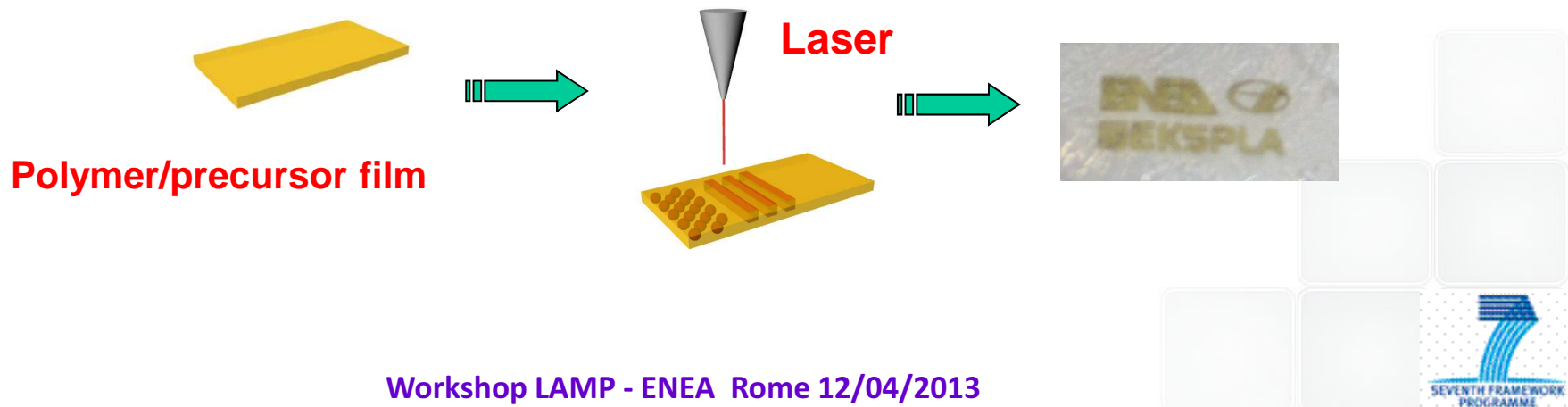
QDs formation by single source precursor thermal decomposition

Metal-organic molecules
(Powder)

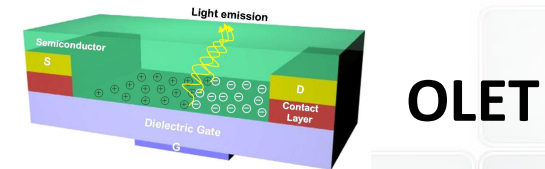
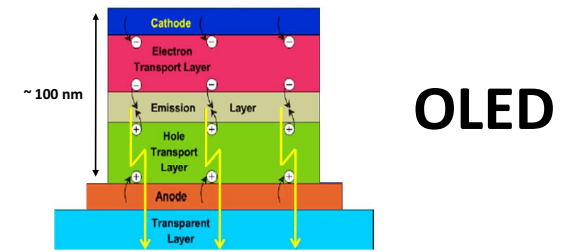
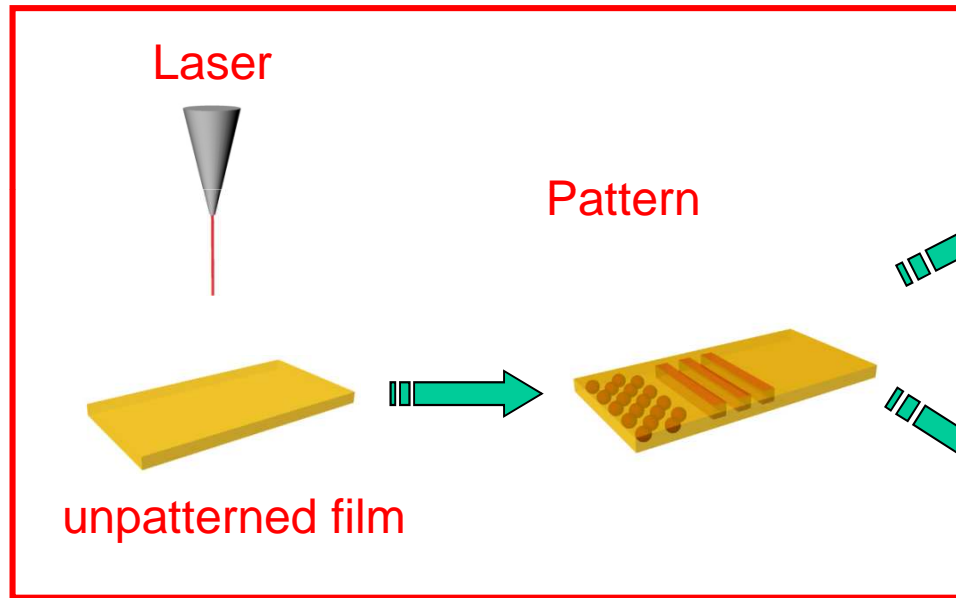


Quantum dots
(QDs)
(Nano-materials)

1. Preparation of thin films containing polymer and precursor.
2. Laser structuring of the material (polymer/precursor) followed by the formation of the nanocomposite **ONLY** in the regions hit by the laser beam.



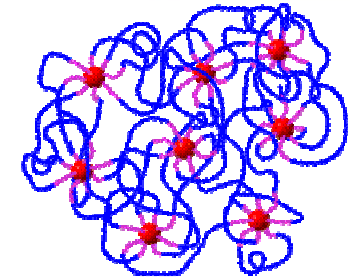
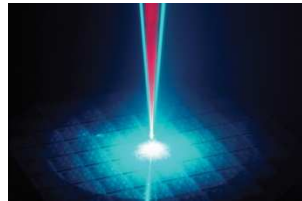
The localised synthesis of the nano-composite is obtained by using a laser source that leads to a desired pattern of generated QDs in the polymer matrix



Patterning on devices

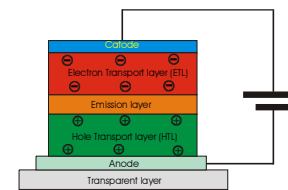
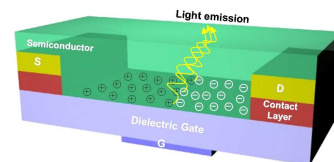


6 The LAMP project join three different technological fields for lighting application



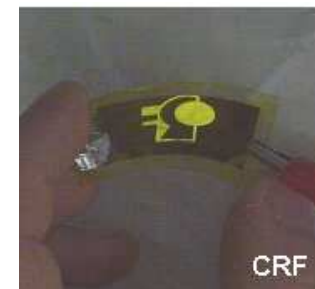
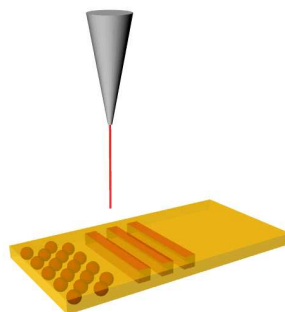
Laser manufacturing

Polymeric nano-structured materials



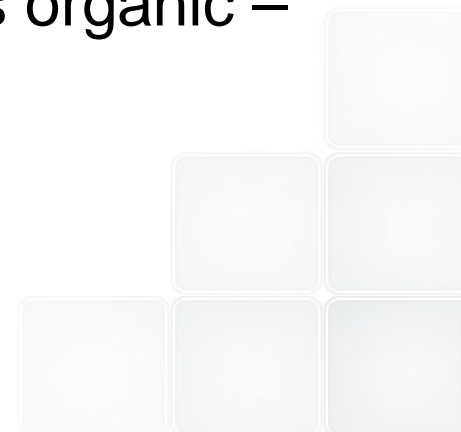
OLET/OLED





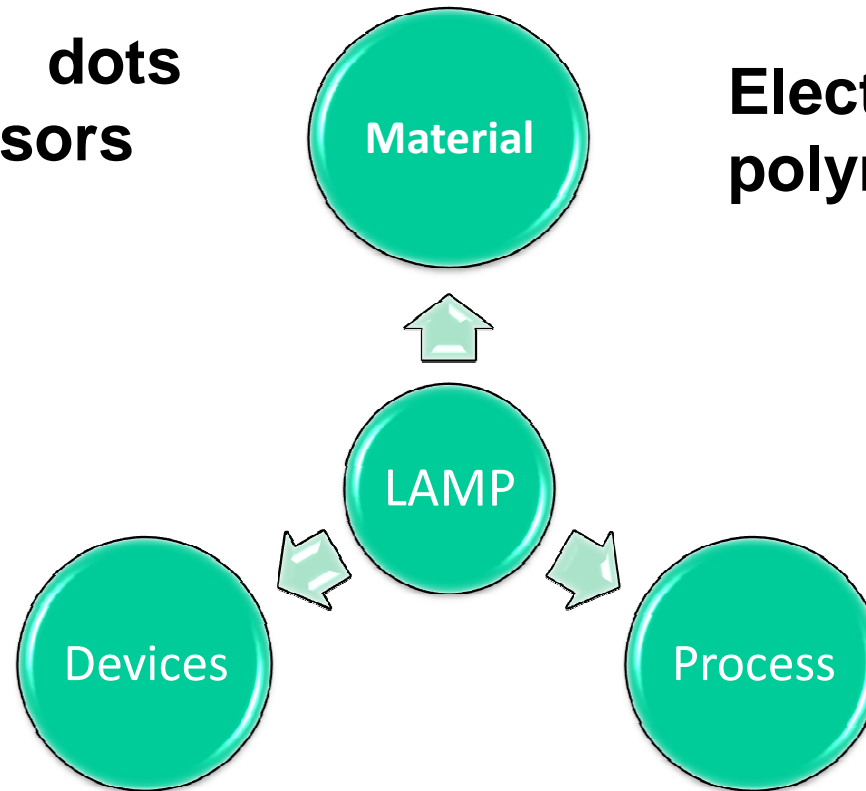
Technological advantages

- Simplification of industrial processes of manufacturing (laser structuring vs photolithography);
- Improvements of optical properties (inorganic vs organic – device life time)



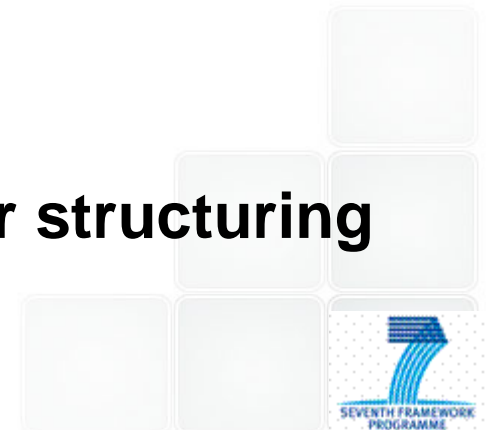
Quantum dots
(QDs) precursors

Electroluminescent
polymers



Laser structured
OLET OLED

Laser structuring



Materials

- Three different QDs precursors (another one in preparation);
- Five different polymers (another one under testing)
- Suitable combination polymer/precursor conditions

Laser Patterning

- Laser manufacturing conditions and apparatus for samples irradiation

Devices

- OLED/T manufacturing with materials set up by the consortium
- Laser patterned devices under preparation

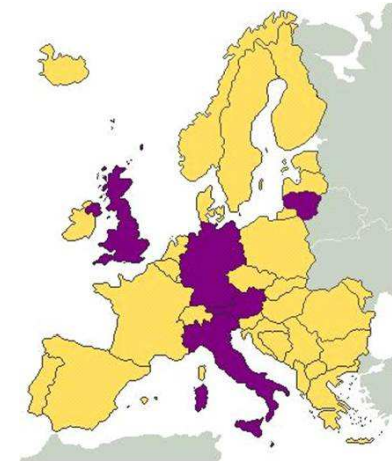
LCA

LCA of devices realised within LAMP



Consortium

- ENEA (coordinator) - Italy
- University of Wuppertal – Germany
- Centro Ricerche Fiat – Italy
- Ekspla UAB – Lithuania
- National Research Council – Italy
- OSC University of St. Andrews – UK
- Joanneum Research – Austria



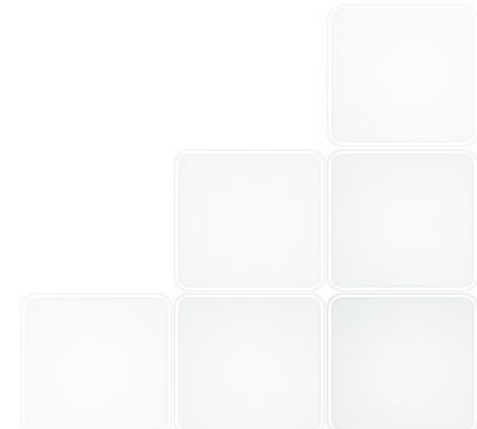
Collaboration

ENEA Research Centres of Casaccia, Bologna, Brindisi, Portici

CNR IMM Bo



UniBo Dipartimento Chimica Industriale



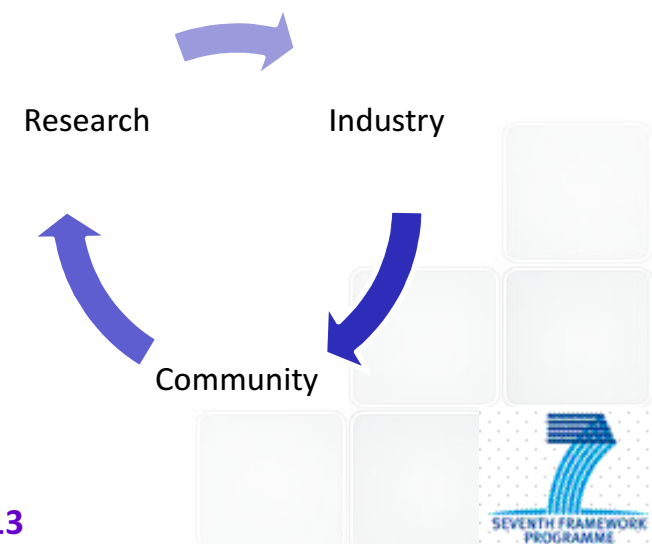
Local support

Thanks to **UTTMATF Laboratory of Faenza** (Torricelli Scientific Park) that hosted the project, **Bologna Research Centre** and **Dr. Stroea** for her work within LAMP.

Thanks to **Brussels ENEA Offices**

Bank Foundation

Within LAMP, a fruitful collaboration with the Bank Foundation of Faenza Area (**Fondazione Banca del Monte e Cassa di Risparmio di Faenza**) was started.



Project www.lamp-project.eu

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