PHOTO-PIEZO-ACTUATORS BASED ON LIGHT SENSITIVE COMPOSITE

PULSE-COM

OBJECTIVES

The aim of PULSE-COM project is to combine photo-mobile polymers (PMP) and lead-free piezo-composites (PZL), to develop and to integrate a new class of Photo-Piezo Actuators.

WHY PULSE-COM?

The results of PULSE-COM project can address various needs in different areas such as biomedical, telecommunications, instrumentation, nanoengineering. The consortium aims at developing a new class of light-driven actuators, such as opto-switches, opto-valves, reconfigurable optics and photoenergy harvesting systems.

CEDRAT TECHNOLOGIES CONTRIBUTION

Cedrat Technologies has designed prototypes of application devices in which PMP supplied by the consortium are inserted as the active key component. For each targeted application a specific test bench has been built and the behavior of PMP-based components have been characterized in laboratory conditions. These tests allow to draw a conclusion on the pertinence of PMP for the applications.

PMP FOR OPTO-SWITCH APPLICATION

Switch evaluation principle: Switches are inserted in an electrical circuit. Current in the switch branch is measured which determines the state (open or closed) of the switch.

Successful proof of concept: The figure below shows the observed behavior of an optical switch.

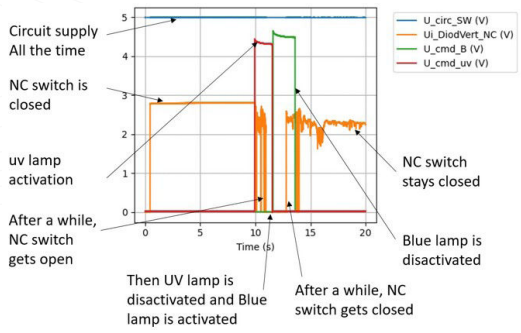


Fig. 2: Switch sequence registration:
NC = Normally Closed

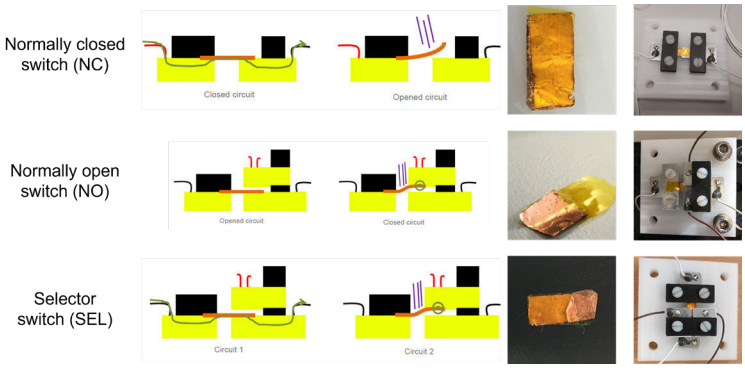


Fig. 1: Opto-switches: design and prototypes

TYPE OF LIGHT	LIGHT COLOR	RESPONSE TIME
λ = 385nm	Ultra violet	1s
λ = 470nm	Blue	2s

Table 1: Switch example of performances

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 863227.

CEDRAT TECHNOLOGIES • 59 Chemin du Vieux Chêne • Inovallée • 38246 MEYLAN Cedex France • Tel. : +33 (0)4 56 58 04 00

www.cedrat-technologies.com | actuator@cedrat-tec.com

www.cedrat-technologies.com | actuator@cedrat-tec.com

PMP FOR OPTO-VALVE APPLICATION

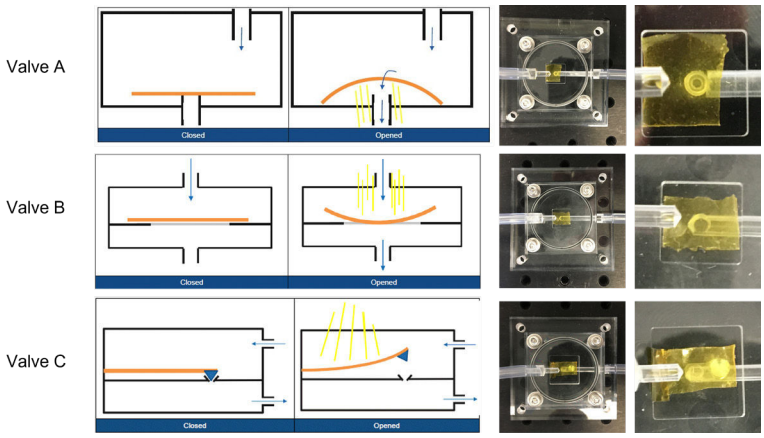


Fig. 3: Opto-valves: design and prototypes

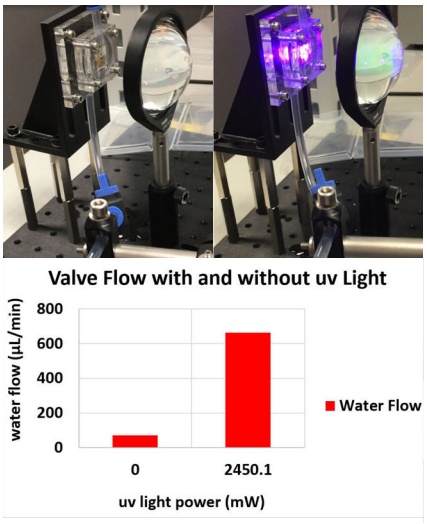
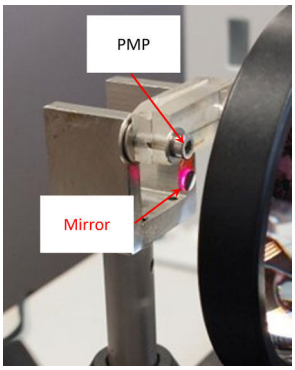
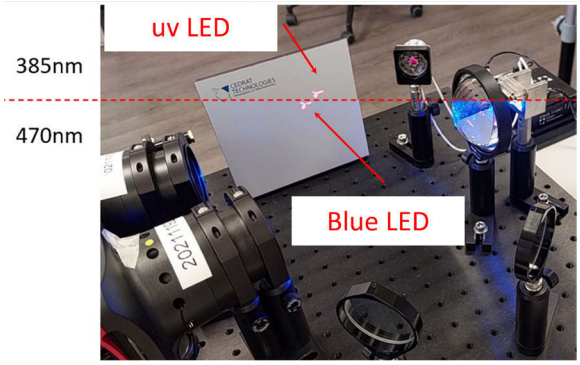


Fig. 4: Flow without and with UV light beam @7900Pa

PMP FOR OPTO-DEFLECTOR APPLICATION

The laser beam is set to a mirror glued on the PMP sample. Alternative activation of blue and ultraviolet lights deviates the laser beam on the screen .





PARAMETER	VALUE
Tilt angle	14 mrad
Frequency bandwidth	0.3 Hz
Stroke quality	Mixed displacement and angular stroke

Table 2: Deflector example of performances

PUBLICATION

P. Meneroud, J. Gauthier, S. Duc, M. Thomachot, F. Claeyssen, "New range of light driven actuation devices", Proc. OPTICS + OPTOELECTRONICS 2023, *Prague, 24-27 April 2023*

CLICK HERE TO WATCH APPLICATIVE VIDEO OF THE PMP

ACKNOWLEDGMENTS

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 863227.