REVOLUTION IN DIGITAL LIGHT PROCESSING (DLP) 3D PRINTING – FLUORESCENT ADJUSTMENT TECHNIQUE (FAT)

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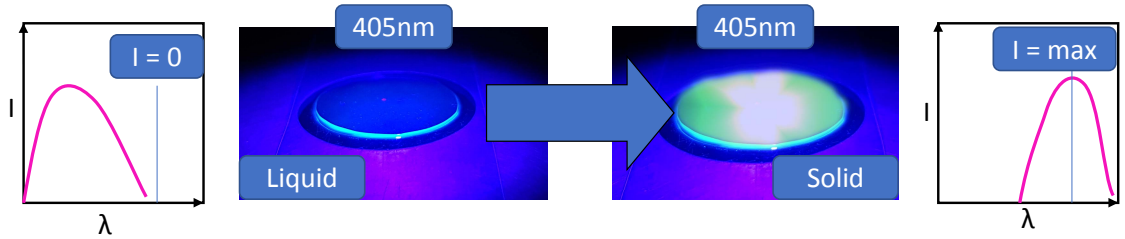
Fluorescent sensors are tiny molecules which exhibit high sensitivity to changes in viscosity and polarity of their microenvironment. Those changes are both rapid and sufficient to be used in the observation of high speed polymerization processes occurring during the 3D printing process. To obtain sufficient fluorescent emission, concentration of molecular probe could be as low as 0.1 % w/w or lower [1]. Due to the huge fluorescent sensor spectral shift from liquid resin to solid 3D printed model, measuring of fluorescence intensity at single wavelength (or defined range of wavelengths), directly in 3D printing process, bring information about stage of curing process and could be applied into almost every material present on the market. High sensitivity of fluorescent molecules and their tuneability enables low cost hardware changes in 3D printer design. For proper operation of FAT, DLP 3D printer need to be modify by addition of optical sensor (or sensor with bandpass filter), and software change which enable real-time changes in layer illumination time.

Thanks to this solution the only calibration needed for high quality printing process is mechanical adjustment of 3D printer, which in DLP techniques are required very often. Every parameter of material could be distinguished by 3D printer itself by reading parameters from coupled FAT system.



[1] J. Ortyl, P. Fiedor, A. Chachaj-Brekiesz, M. Pilch, E. Hola, M. Galek, The Applicability of 2-amino-4,6-diphenyl-pyridine3-carbonitrile Sensors for Monitoring Different Types of Photopolymerization Processes and Acceleration of Cationic and Free-Radical Photopolymerization Under Near UV Light, Sensors 2019, 19, 1668.