

Facile fabrication of stimuli responsive opal structured hydrogel arrays in a 96 well plate format

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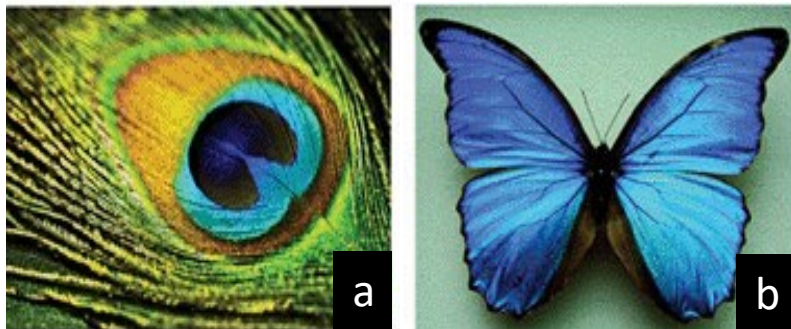
PI- Prof Hyunmin Yi

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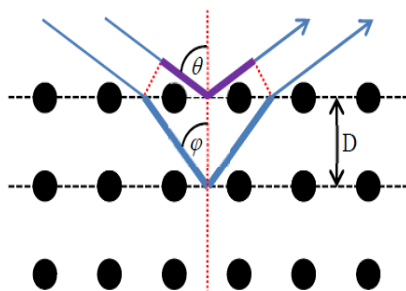


School of
Engineering

Background: Structural Color



Periodic feather arrangement in (a) peacock feathers and (b) wings of Morpho butterfly, produces iridescence



Multilayer light interference used to design artificial opals

$$\lambda = 1.633D \sqrt{(1 - \phi)n_{spheres}^2 + \phi n_{background}^2}$$

Modified Bragg's Equation

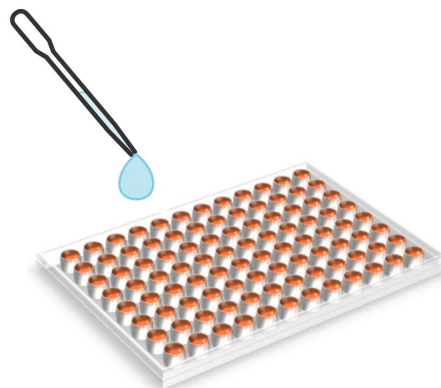
λ = wavelength of light

D= diffraction plane spacing

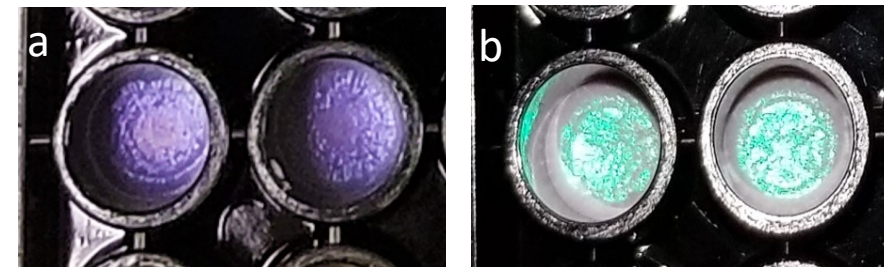
ϕ = void fraction

n= refractive index

2-Step Process - Step 1: Opal deposition on 96 well plate

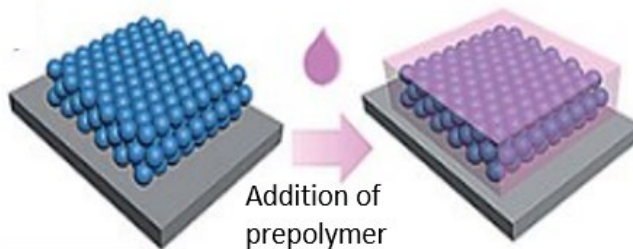


Reliable and simple, evaporation induced deposition of polystyrene(PS) used to generate artificial opals using industry standard format (96 well plate)



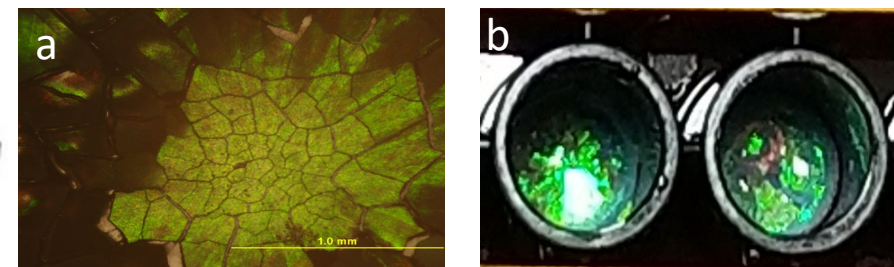
Periodic ordered deposition of PS generates intense color
(a) size 180-200 nm (b) 220-230 nm

Step 2: Capture opal structures by polymerization



Schematic of polymerization process

Opal hydrogel particles



Deposited opal structures captured by hydrogel after simple polymerization process

(a) Image taken by microscope (b) Image taken by camera

References

- 1) Fudouzi, H. (2011). Tunable structural color in organisms and photonic materials for design of bioinspired materials. *Science and technology of advanced materials*, 12(6), 064704.
- 2) Takeoka, Y. (2013). Stimuli-responsive opals: colloidal crystals and colloidal amorphous arrays for use in functional structurally colored materials. *Journal of Materials Chemistry C*, 1(38), 6059-6074.
- 3) Sun, J., Bhushan, B., & Tong, J. (2013). Structural coloration in nature. *Rsc Advances*, 3(35), 14862-14889.