

# ADVANCED SUSTAINABLE FLOATING PHOTOCATALYSTS FOR WASTEWATER REMEDIATION



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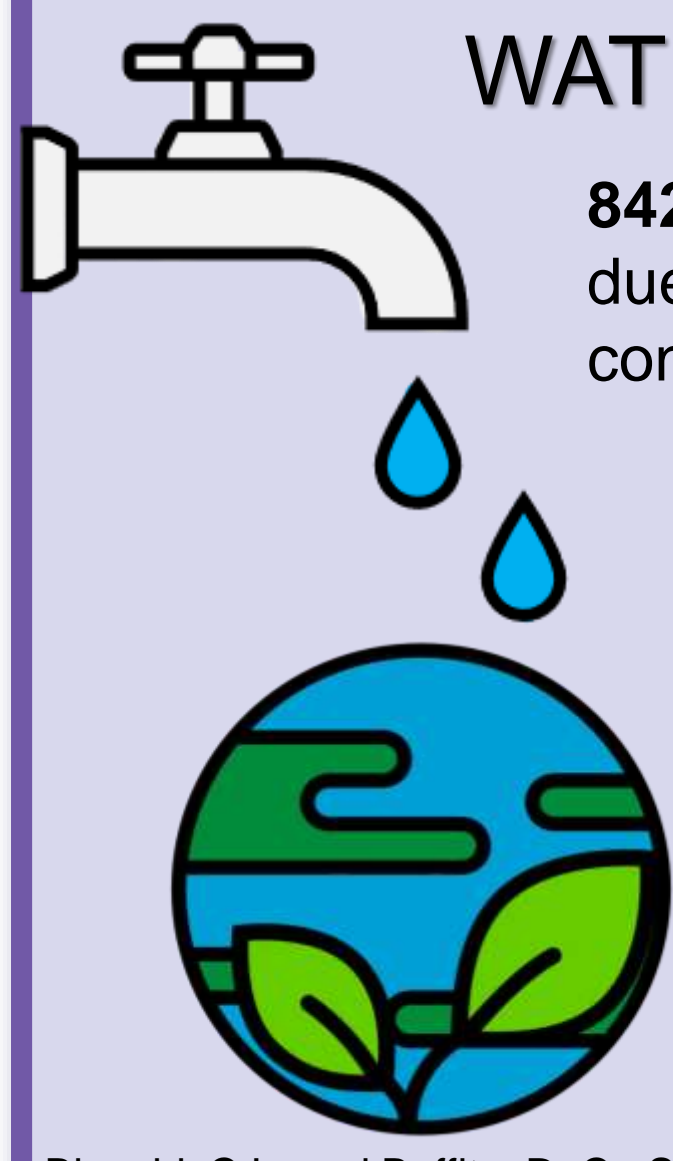
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## ABSTRACT



### WATER CRISIS

842,000 people die every year due to unsafe drinking water consumption.

80% illnesses in developing countries result from unhealthy water.

1 out of 4 deaths of children under the age of five are the result of water-related illnesses



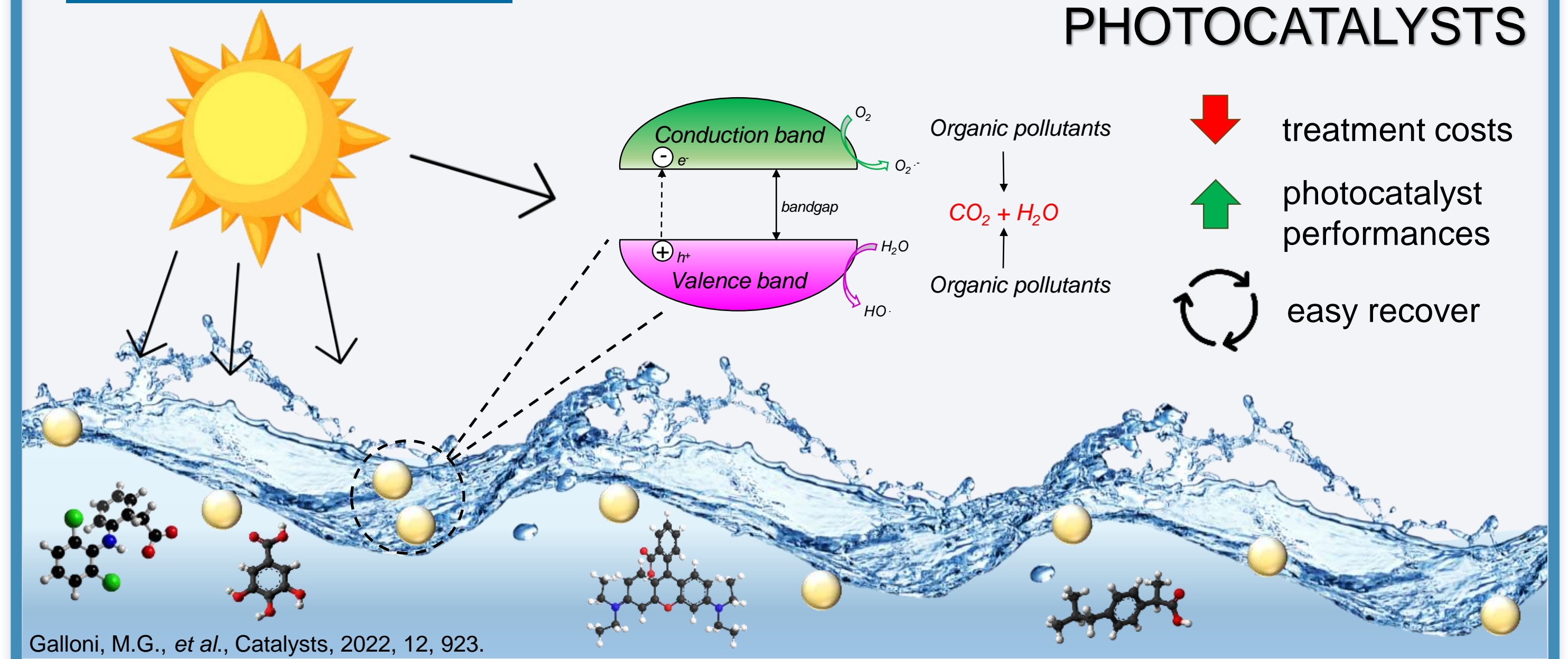
### OUR MISSION

Clean water for everyone



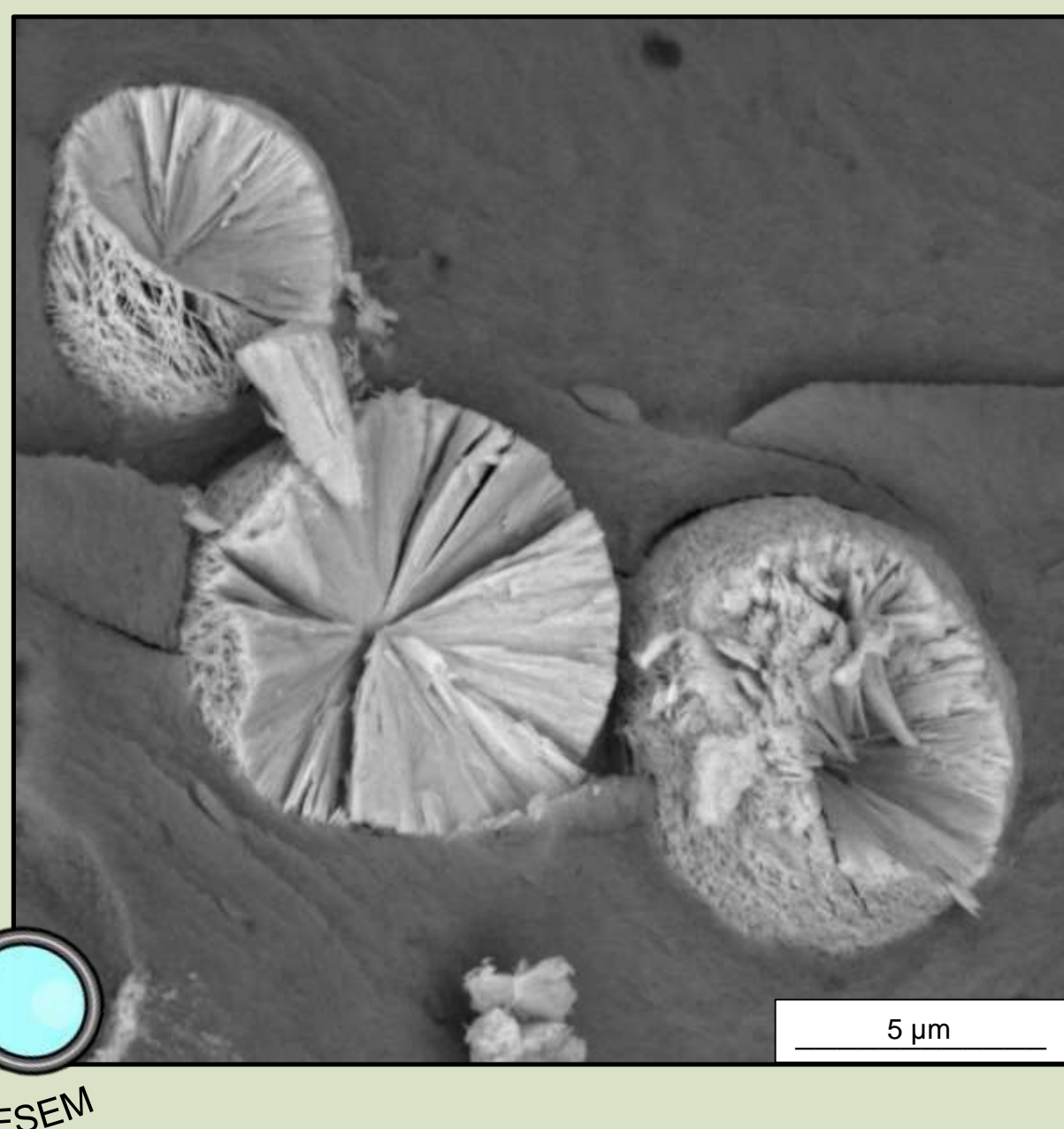
Bianchi, C.L. and Boffito, D. C., SUNFLOAT project, Velux Stiftung.

## METHODS



## RESULTS

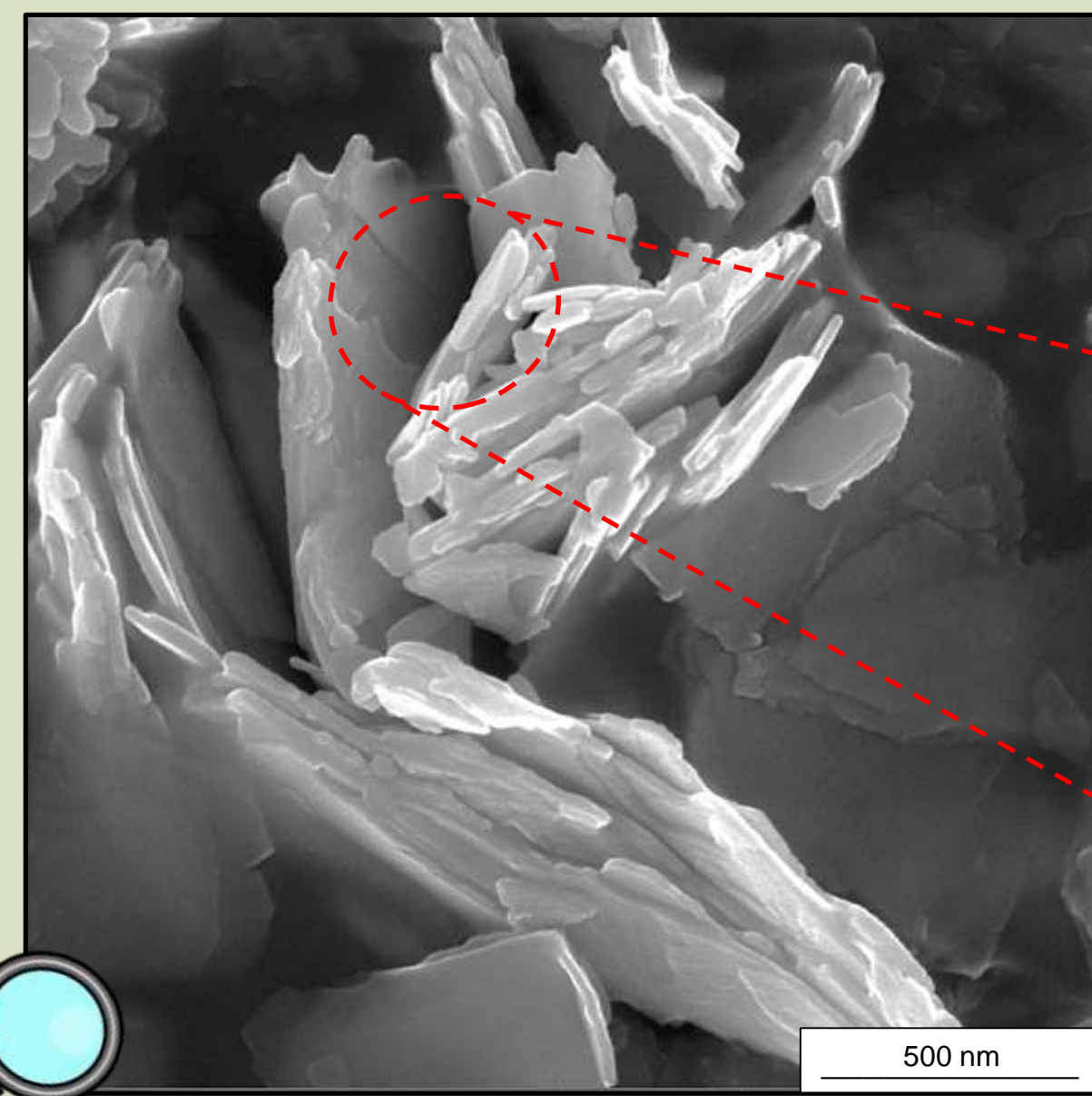
BiOBr/alginate spheres



Homogeneous growth of BiOBr onto alginate spheres

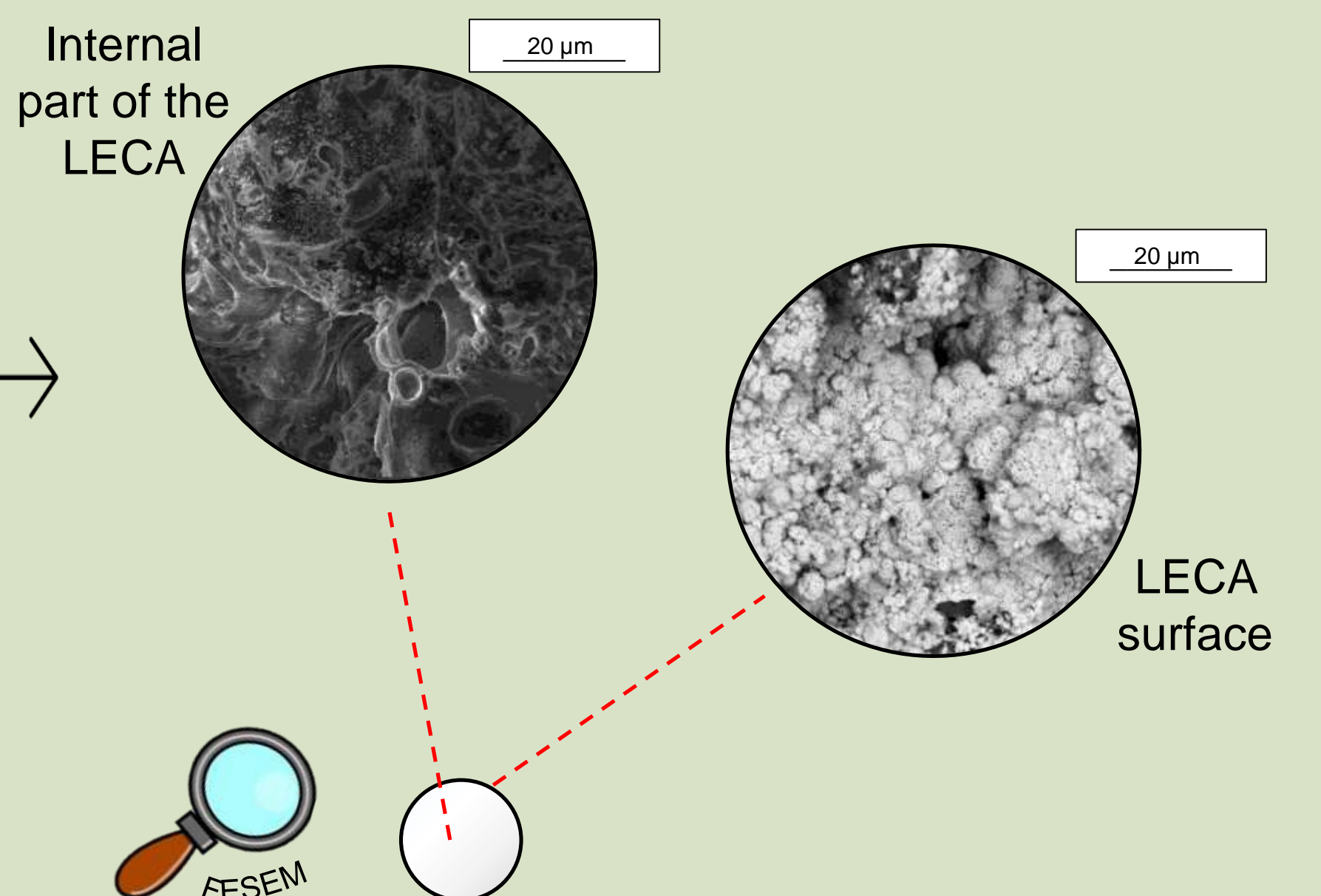
ACTIVE PHASE:  
Bismuth oxybromide (BiOBr)

Surface area<sup>a</sup> = 10 m<sup>2</sup>·g<sup>-1</sup>, bandgap<sup>b</sup> = 2.63 eV, pH<sub>pzc</sub> = 6.13



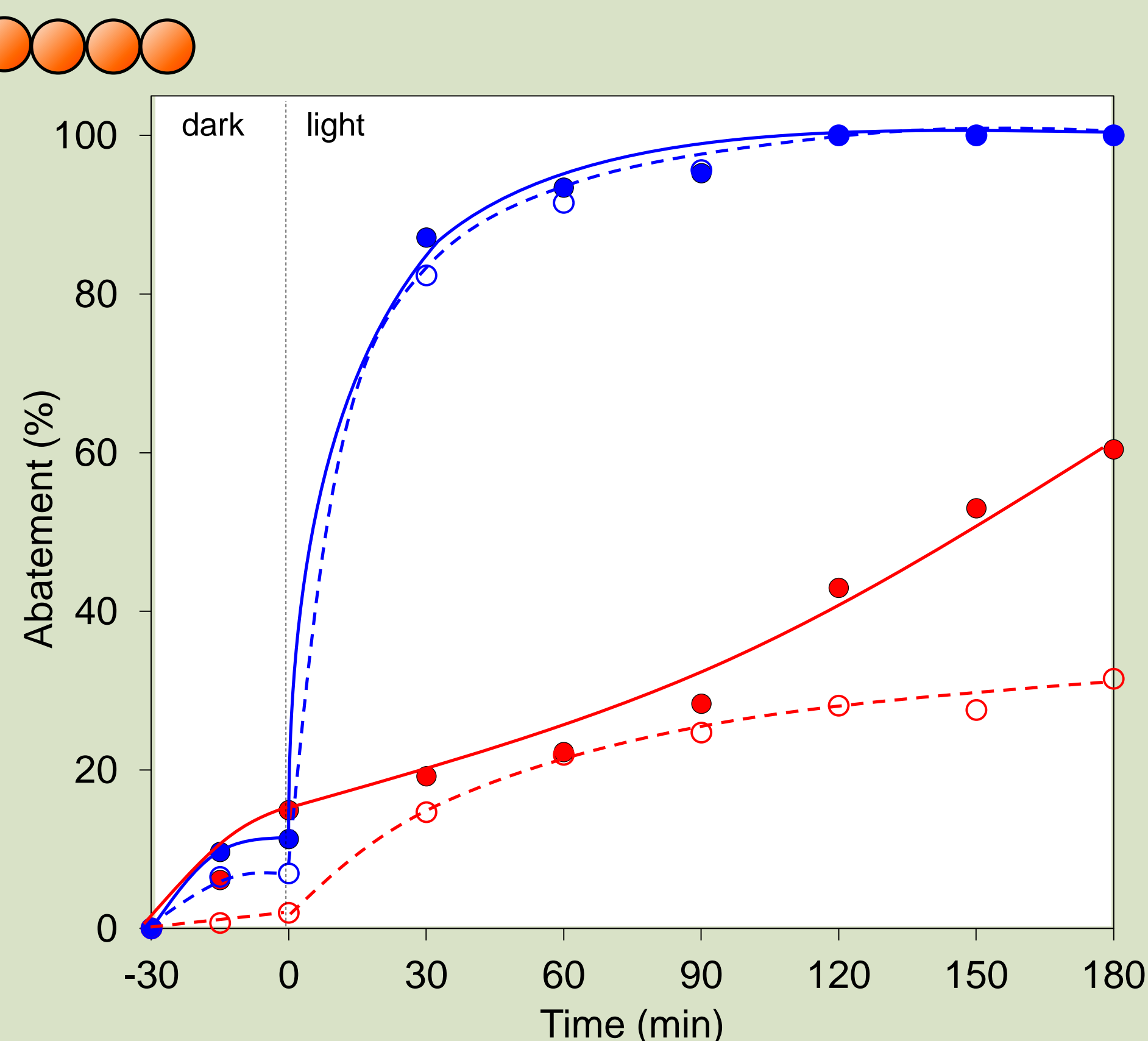
Intermediate morphology between the flower-like shape and the plain intercalated lamellar one, made up of nanosheets/nanoroads

BiOBr/LECA (Lightweight Expanded Clay Aggregates)



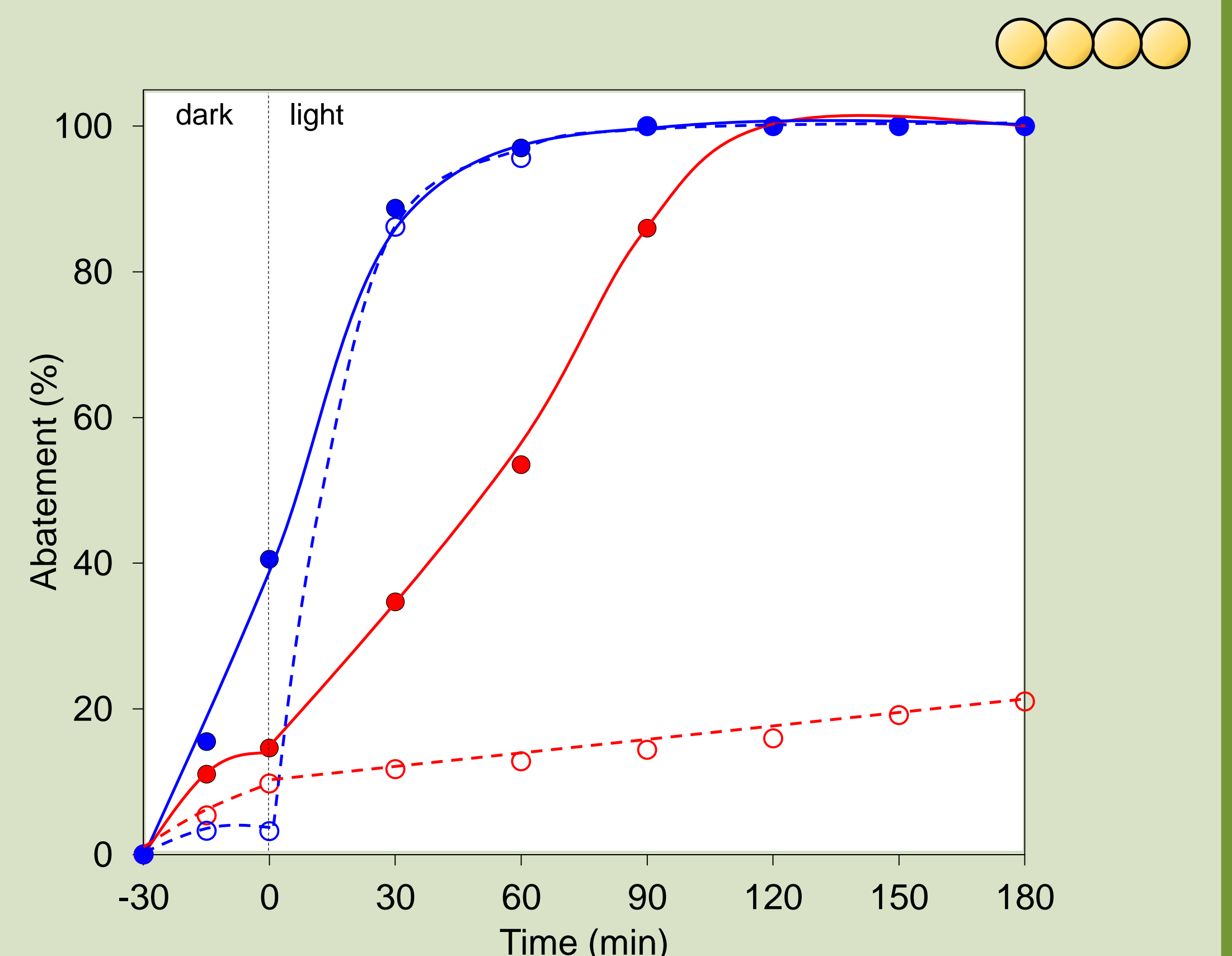
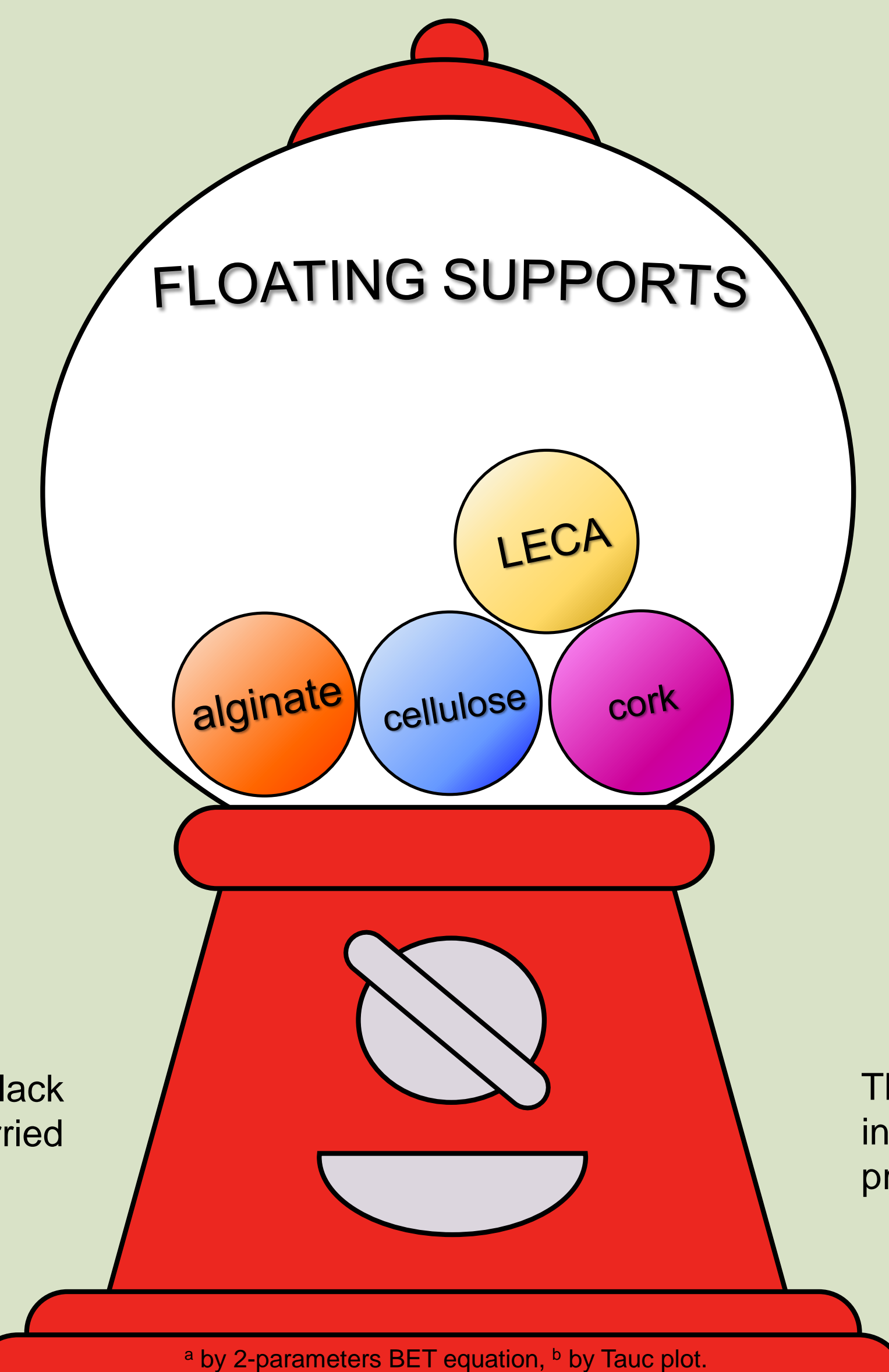
BiOBr growth at the LECA surface

Performances in the presence of a mixture of drugs, *i.e.*, diclofenac (DCF) and ibuprofen (IBU) in ultrapure water (UW, full symbols) and simulated drinking water (DW, empty symbols)



Both floating photocatalysts are efficient in the DCF abatement, whereas lack activity towards that of IBU. This was emphasized when the reaction is carried out in DW.

Experimental conditions: 30 min dark plus 180 min solar irradiation (35 W·m<sup>-2</sup>); [DCF + IBU] = 10 mg·L<sup>-1</sup>; 0.72 g·L<sup>-1</sup> BiOBr/alginate spheres (right) or 3 g·L<sup>-1</sup> BiOBr/LECA (left)



The detected trend can be related to a competition between DCF, IBU and inorganic ions for the active sites, as well as to the adsorption of DCF's by-products on the active sites of the photocatalyst and/or of the floating support.

Thanks to Pr. G. Cerrato and Dr. A. Giordana (Università degli Studi di Torino) for FESEM micrographs. Falletta E. et al., ACS Photonics, submitted; Galloni, M.G. et al., Catalysts, 2022, 12, 923.

## CONCLUSIONS

Floating photocatalysts were successfully prepared and tested in the photodegradation of different organic pollutants (*e.g.*, diclofenac and ibuprofen) under solar light irradiation in UW and DW. DCF is always completely removed, whereas IBU degradation is strongly related to the environment and the type of floating support employed.

○ Tests approaching real conditions (sustainable vessel in the presence of real waters to obtain drinkable water)



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