
Micro-nanopatterned films prepared by NIL sol-gel method for photocatalytic solar fuel generation

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Résumé

This work aims to develop novel concepts using advanced micro and nanostructured media enabling incoherent light confinement dedicated to photocatalysis, and compatible with wide area patterning (1). Our two objectives are (1) to elaborate high accuracy and specifically designed nanopatterns made of TiO₂ sol gel layers over wide areas and (2) to investigate the properties of the optically functionalized photocatalysts using a dedicated high precision optical characterization in relation with photocatalytic H₂ production (Figure 1). To achieve this, from our previously results (2), we have developed a complete methodology including electromagnetic simulation to design periodic photonic structures enabling efficient light trapping in the UV range, sol-gel layer preparation (from different formulations), micro-nanopatterning over wide areas by Step-and-Repeat Nanoimprint Lithography (NIL) and advanced experimental characterization in optics and photocatalysis. This process enables to obtain specifically designed complex and well controlled patterns, adaptable to different substrates (large and/or unconventional), over a wide area so as to enable photocatalysis experiments, and with production costs compatible with future industrial development. Here we will present the different stages leading to a useful surface for hydrogen generation by photoreforming of carbohydrates.

*Intervenant

- (1) Goto, Y., Hisatomi, T., et al. (2018). *Joule* 2 (3) : 509-520.
- (2) Capitolis, J., Hamandi, M., et al. (2021). *Nano Select*, 1: 1-10.