Flat optics Hybrid MoS_2/polymer films for photochemical conversion

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Supporting information

Morphological characterization

Here are reported the 2D self-correlation of AFM topographies that are extracted through the WsXM software (Fig. SI1a). The period of the lattice D is obtained by measuring the distance between the maximum and the second peak of the line profile reported in Fig. SI1b. The AFM topography of the large area samples is measured at several locations separated macroscopically.

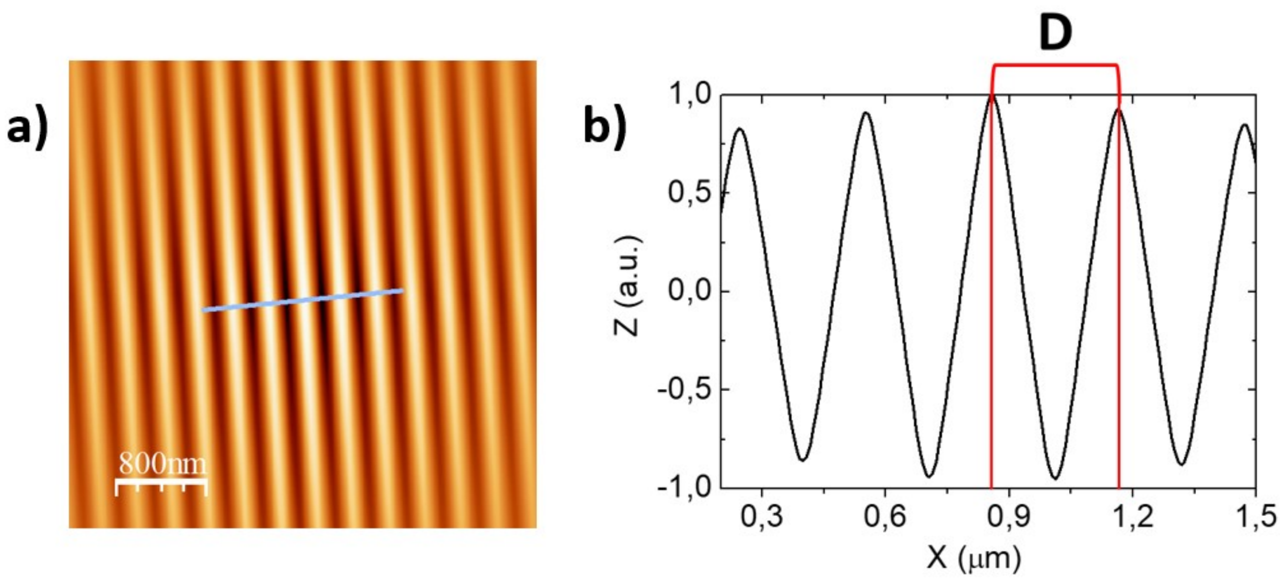

Figure SI1 a) 2D autocorrelation function of the AFM topography of Fig.2c of the main manuscript. b) Line profile of the 2D autocorrelation function corresponding to the blue bar in panel a).

Dependence of optical anomaly wavelength on refractive index of external medium

In figure SI2 we show the values of the minima measured in air (black line) and measured in water (red line). From their trend we can see a shift of the wavelength towards red, as expected from the theoretical trend of the Rayleigh Anomaly due to the variation of the refractive index.

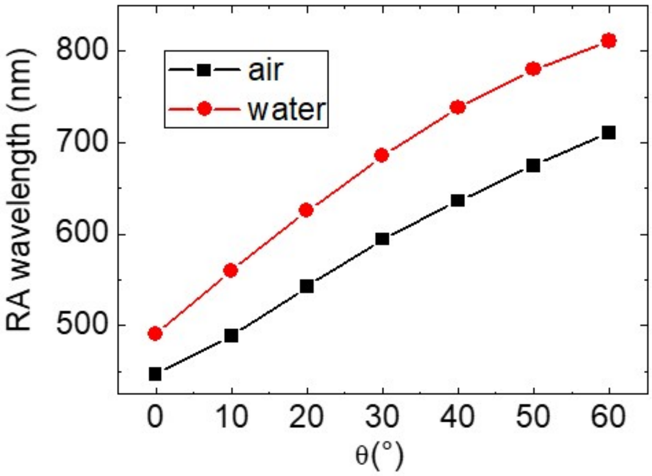

Figure SI2 Minima detected in air (red squares) and in water (red circles) for different angles of illumination.

Angle resolved Optical extinction and photodissociation

Figure SI3a shows a picture of the custom-made set-up for the acquisition of angle-resolved transmission spectra both in air and liquid. Specifically, the sample is inserted into a quartz cuvette by means of a system that allows to vary its orientation. The same system has been used during the photocatalytic exposures, as shown in Figure SI3b, allowing to vary the illumination angle.

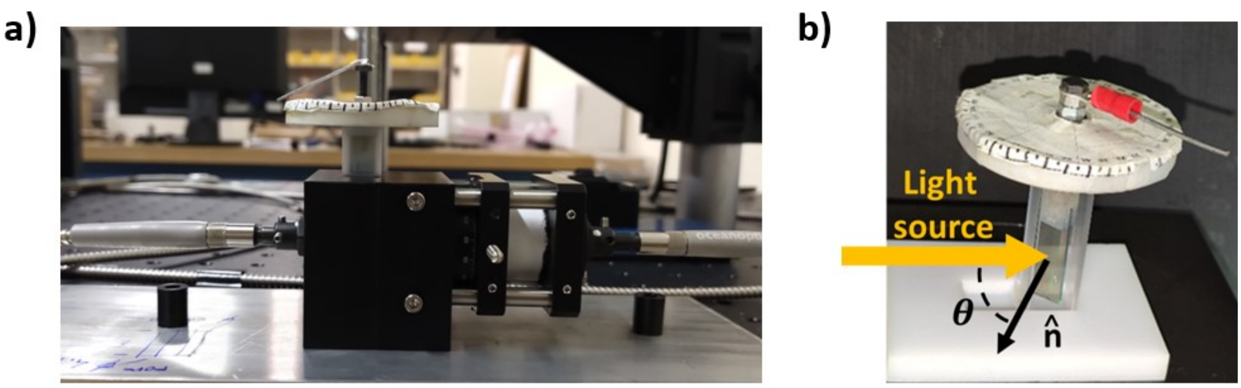

Figure SI3 a) Photo of the custom-made set-up for the acquisition of optical spectra with angle-resolved inclination b) photo of the goniometric stage used to vary the orientation of the sample respect to the illumination during the exposure.

Sample fabrication

Figure SI4 shows in a schematic manner the main steps of the nanostructuring process used in the Light Interference Lithography (LIL).

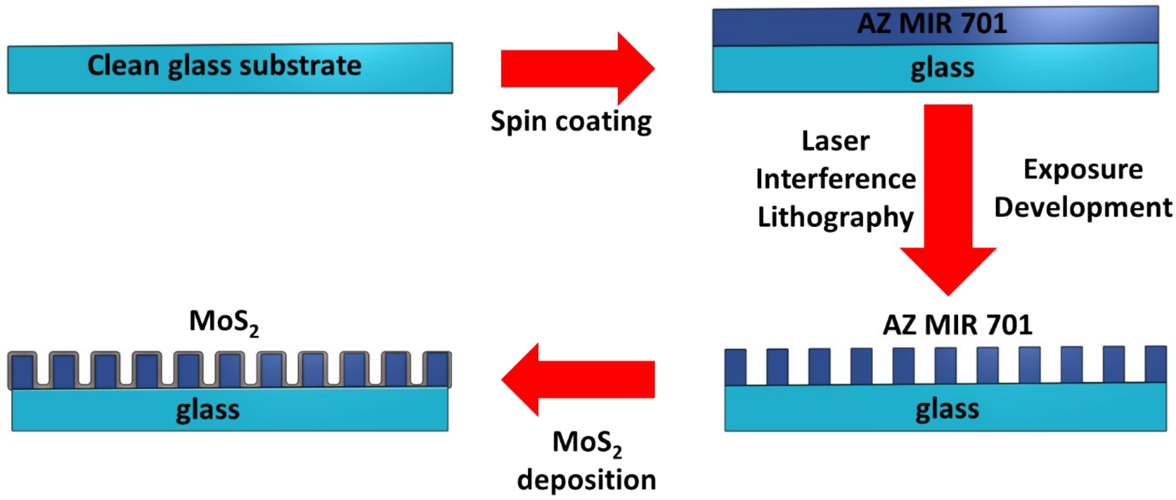

Figure SI4 Sketch of surface nanostructuring obtained by Light Interfere Lithography (LIL).

Angle resolved total absorption measurements

A custom-modified optical setup based on a Thorlabs 4P4 integrating sphere has been developed (Fig. SI5). A polarized supercontinuum light source has been coupled in free space to the integrating sphere via polarizers and broadband neutral filters. The sample is positioned into the integrating sphere via a custom-developed sample holder that allows the controlled tilting and positioning with respect to the illumination source. This holder has been 3D printed using a white PLA filament. It is thus possible to control the light incidence angle (θ) on the sample, while the outcoming light is coupled to a VIS-NIR optical spectrometer (Ocean Optics HR4000) via optical fiber. The total absorption spectra are evaluated as $A(\theta) = 1 - T(\theta) = 1 - \frac{S_{meas}(\theta) - S_{dark}}{S_{ref} - S_{dark}}$, where S_{dark} is the spectrum acquired with the light source off, S_{ref} the reference spectrum (acquired with light source on and the sample lifted up, so that it doesn't directly intercept the light source) and $S_{meas}(\theta)$ is the spectrum acquired with the sample intercepting the input light source with an incident angle θ. The substitution errors of the integrating sphere, evaluated with respect to a reference non-absorbing substrate, are estimated in the range of 3%. The supercontinuum laser employed for illumination limits the minimum wavelength to about 500 nm.

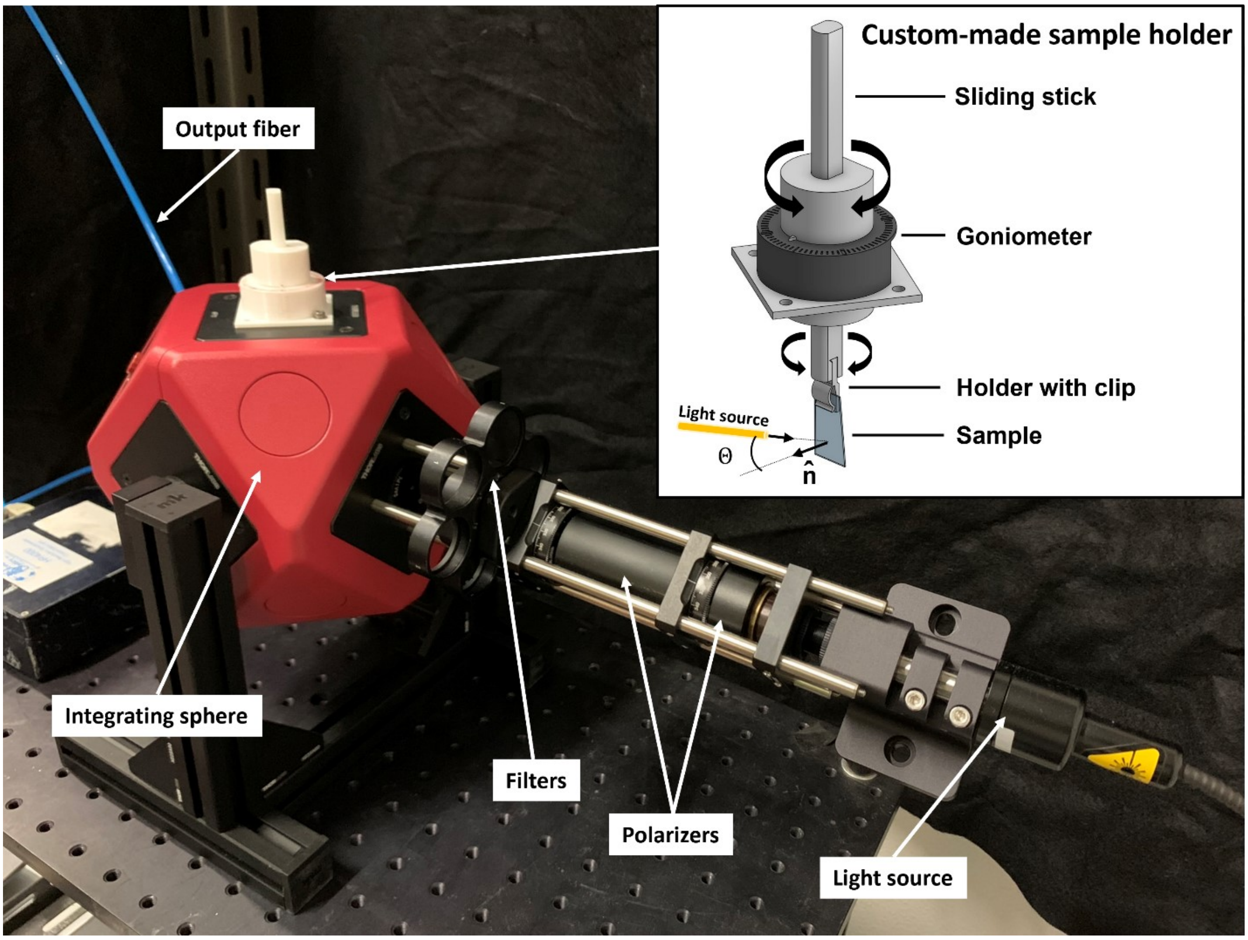

Figure SI5: Custom-made integrating sphere setup for VIS-NIR total absorption measurements.