Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary information

Microbial colonisation of transparent glass-like carbon films triggered by a reversible radiation-induced hydrophobic to hydrophilic transition

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Atomic force microscopy measurements. Surface topography of the carbon film was analyzed by atomic force microscopy (AFM) using a Park XE150 apparatus. The images were acquired in non-contact mode using a non-contact cantilever (PPP-NCHR, Park System) with a tip set point of about ~30-40 nm and amplitudes between ~25-45 nm and a scan rate of 0.50Hz. The images (512 x 512 pixels and areas of 10 μm^2 and 2 μm^2) were processed and analyzed using XEI software (version 1.7.1). A comparison of AFM scans before treatment (Figures S1 a, c, e and g) and UV treated samples in the same areas showed globular and vermicular features appearing after both dry (Figures S1 b and f) and wet (Figures S1 d and h) irradiation. Some of the cavities of non-irradiated samples almost disappeared. A deeper analysis showed that the globular and vermicular features detected after UV treatments derived from surface features presented in the carbon film/PMMA composite PMMA transfer (Figures S1e and f). These features seemed to swell and smooth their edges because of the irradiation. UV treatment in wet air seems to show smoother and more swollen features than those irradiated in dry air. We analyzed the surface features of the copper foil treated with the same synthesis conditions (850 °C) but without ethylene, to avoid carbon film synthesis. The results showed that copper foil developed roughness in the form of small domes of about 300 nm, which were transferred to the carbon film/PMMA composite as cavities of approximately the same size (Figures S1 g and h).

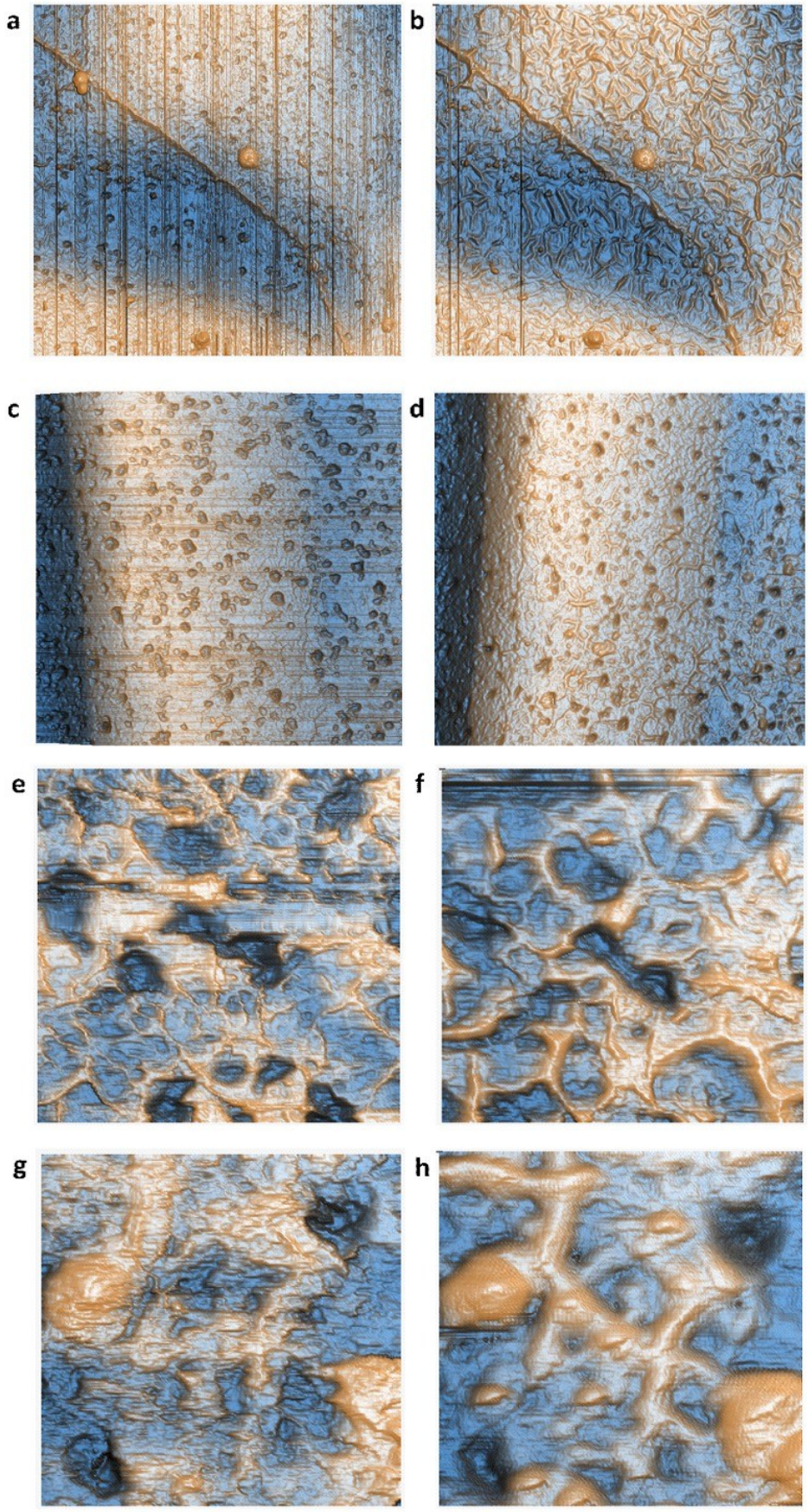

Figure S1. AFM analysis of the surface of carbon film/PMMA composites before UV treatments (a, c, e, g) and after UV dry treatment (b, f) and UV wet treatment (d, h). Vertical and horizontal lines are typical AFM artifacts (a-d: 10 x 10 µm, d-h: 1 x 1 µm).

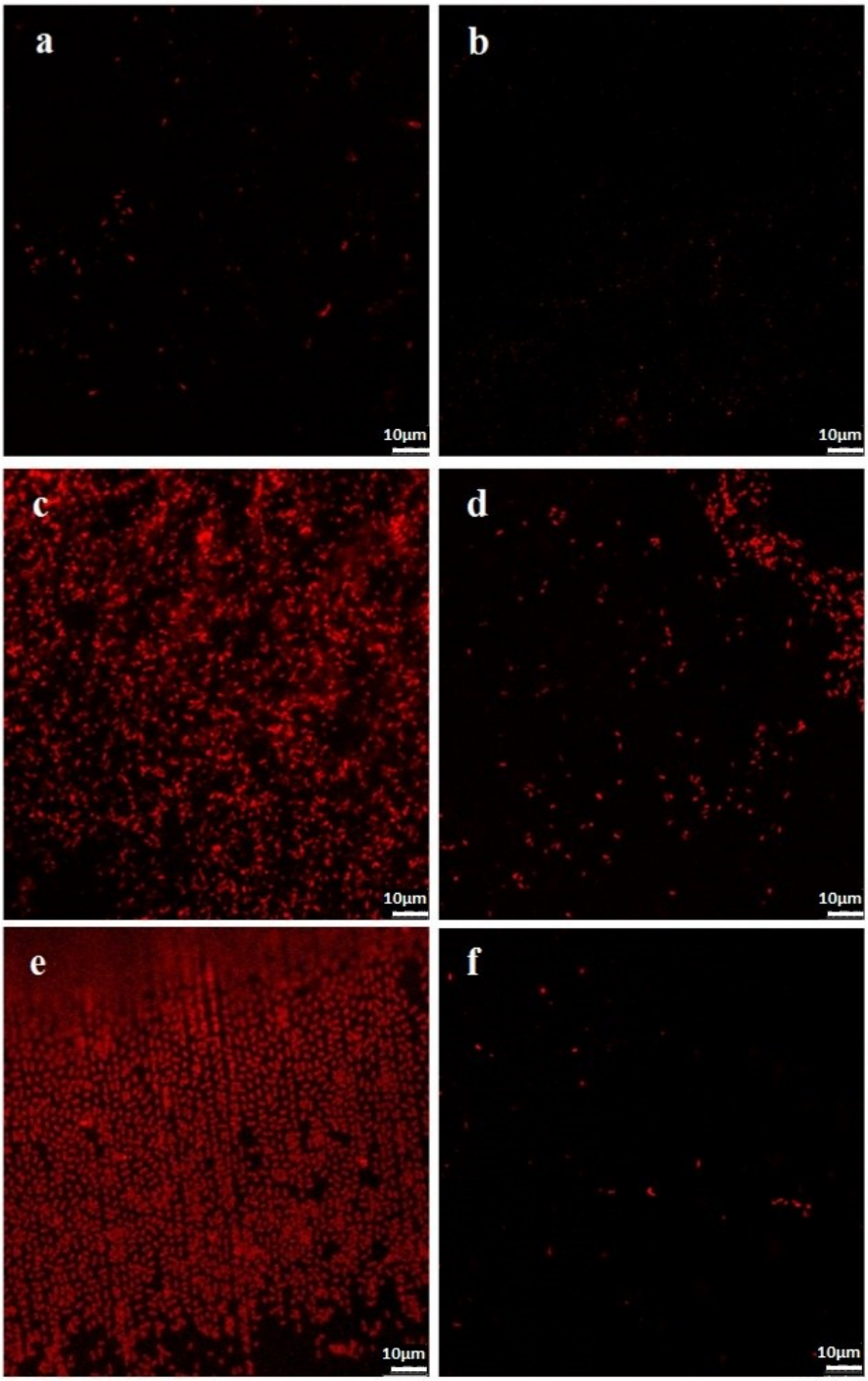

Figure S2. FilmTracer SYPRO Ruby staining revealing biofilm matrix for *E. coli* cultured on (a) glass-like carbon film as produced, (b) vacuum preconditioned film, (c) chamber-irradiated films in dry air, (d) chamber-irradiated films in wet air, (e) lamp-irradiated films in dry air and (f) lamp-irradiated films in wet air