Toward Self-Healing Coatings: Bacterial Survival and Calcium Carbonate Precipitation in Acrylic and Styrene–Acrylic Model Paint Films

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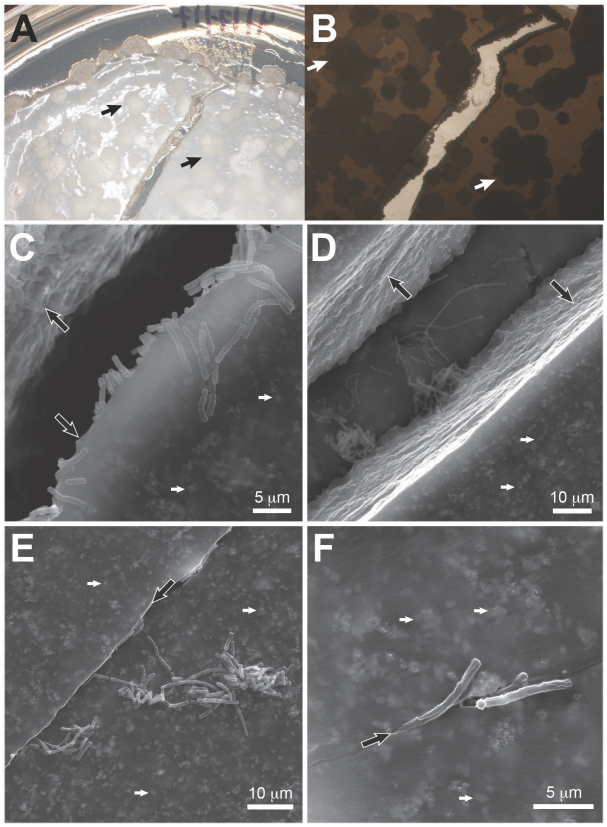
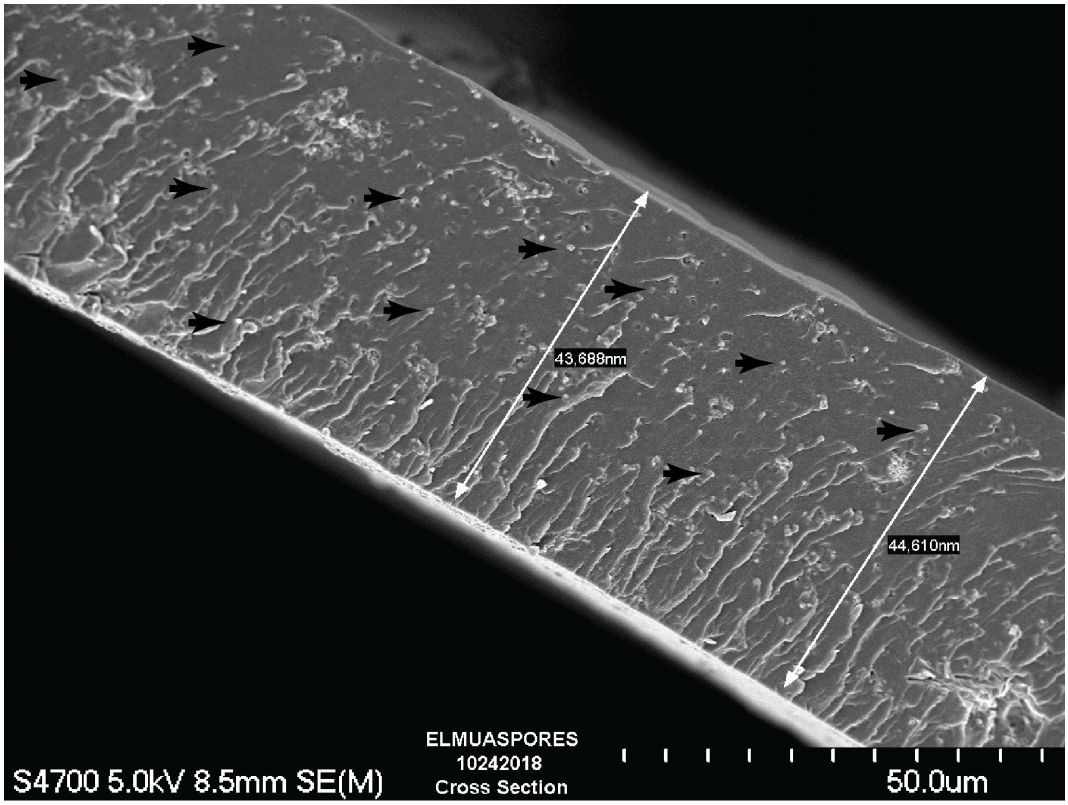
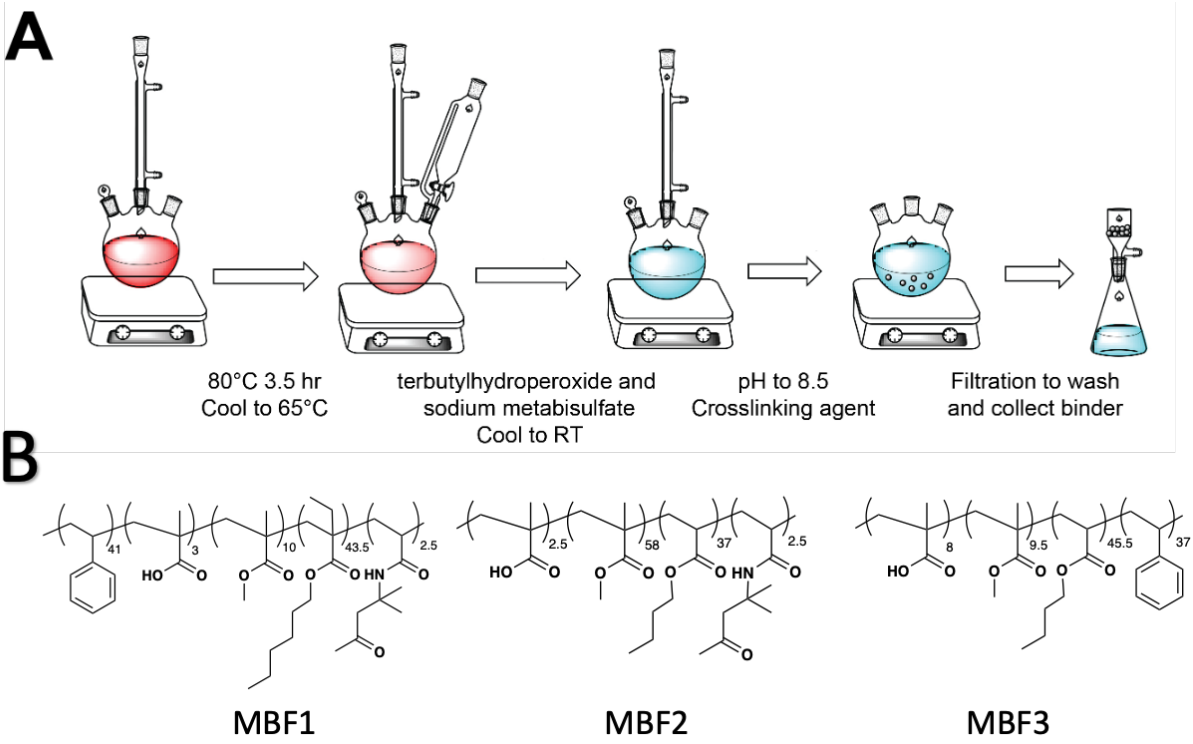


Supplemental Figure S1. Growth of B. simplex str. GGC-P6A in a model paint film made with the styrene-acrylic latex, MBF1. A) Direct light image of colonies of GGC-P6A growing on the surface of the paint film. Cells can be seen growing along a crack and spreading out from the edge of the film. B) Transmitted image of the same paint film in A, more clearly demonstrating colony growth. The arrows in A and B highlight the same colonies, allowing registering of the two images. C-F) SEM images of GGC-P6A cells growing along the edges and emerging from cracks in the paint film. In C and D) The black/white arrows indicate the edge of the paint film, with the bacilli seen tracking along breaks in the film and (D) onto the agar matrix below. In E and F) the bacilli can be seen emerging out of microscopic cracks in the agar (black/white arrows). In images C-F, the electron-dense $CaCO_3$ precipitates of the ABBAFIL slurry can be seen dispersed through the paint film (examples indicated by small white arrows).



Supplemental Fig. S2. Paint films were drawn down and allowed to dry for 24 hours, before being punched out into a 25 diameter paint coupons (Fig. 5). In order to determine a standard thickness/volume for these coupons, they were cooled in liquid nitrogen and then freeze-fractured. The thickness of the film coupons was then measured via SEM (white arrows) at an average 45 mm thick. The shown film contains GGC-P6A spores, which can be seen distributed throughout the film (examples shown with black arrows).



Supplemental Fig. S3. Binder synthesis. A. The general schematic for the polymer synthesis method. B. The final polymer chemistry for each of the synthesized binders, MBF1 (a styrene acrylic), MBF2 (an acrylic latex) and MBF3 (a styrene acrylic cross-linked with Zn).