Supporting Information for

A Micro/Nanoscale Approach for Studying Scale Formation and Developing Scale-Resistant Surfaces

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Figure S1

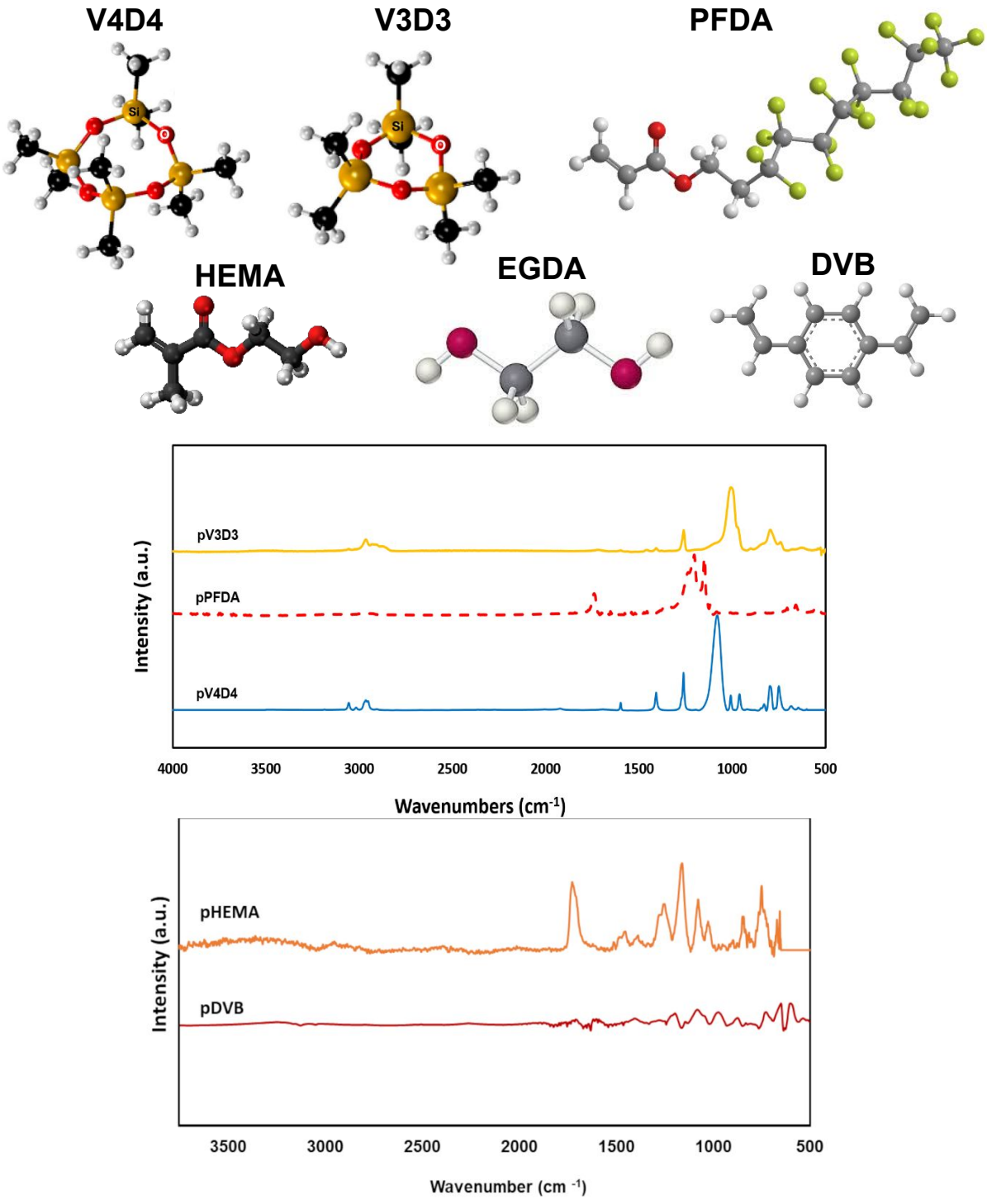

Figure S1: (Top) Ball-and-stick molecular model of various monomers used for polymer-coating of the silicon and steel substrates: tetravinyl-tetramethylcyclotetrasiloxane (V4D4); trivinyl trimethyl-cyclotrisiloxane (V3D3); perfluorodecylacrylate (PFDA). (Bottom) FTIR spectra of the pV4D4, the pV3D3, pPFDA, pDVB, and pHEMA indicating retention of various functional groups and successful polymerization via iCVD.

Figure S2

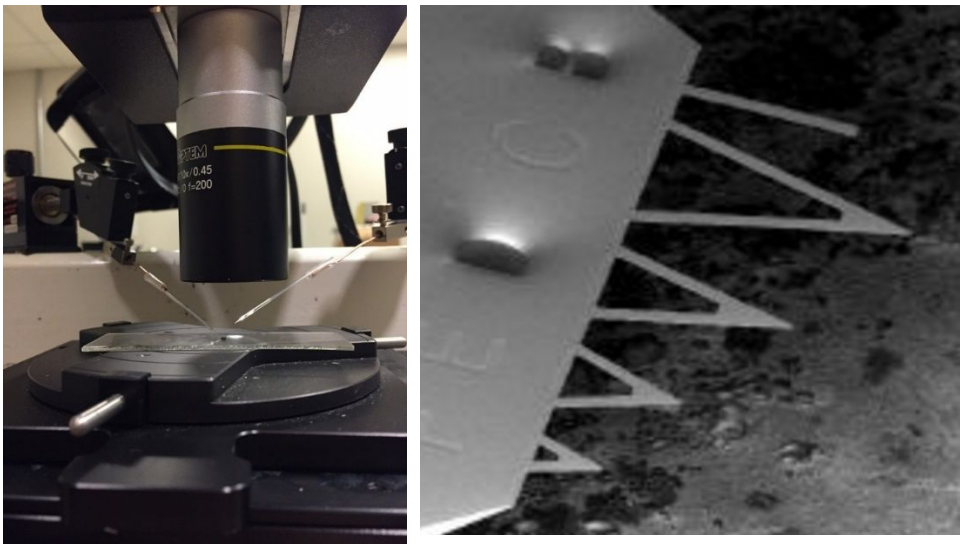

Figure S2: (Left) Photograph of the micromanipulator set up used for adhering calcium sulfate dihydrate salt microparticles on tip-less cantilevers. (Right) SEM image of various tip-less cantilevers on a MLCT-O10 probe; the tip-less cantilever "F" with stiffness of 0.6 N/m was used for adhering salt microparticles to allow measuring adhesion forces up to 30 nN.

Figure S3

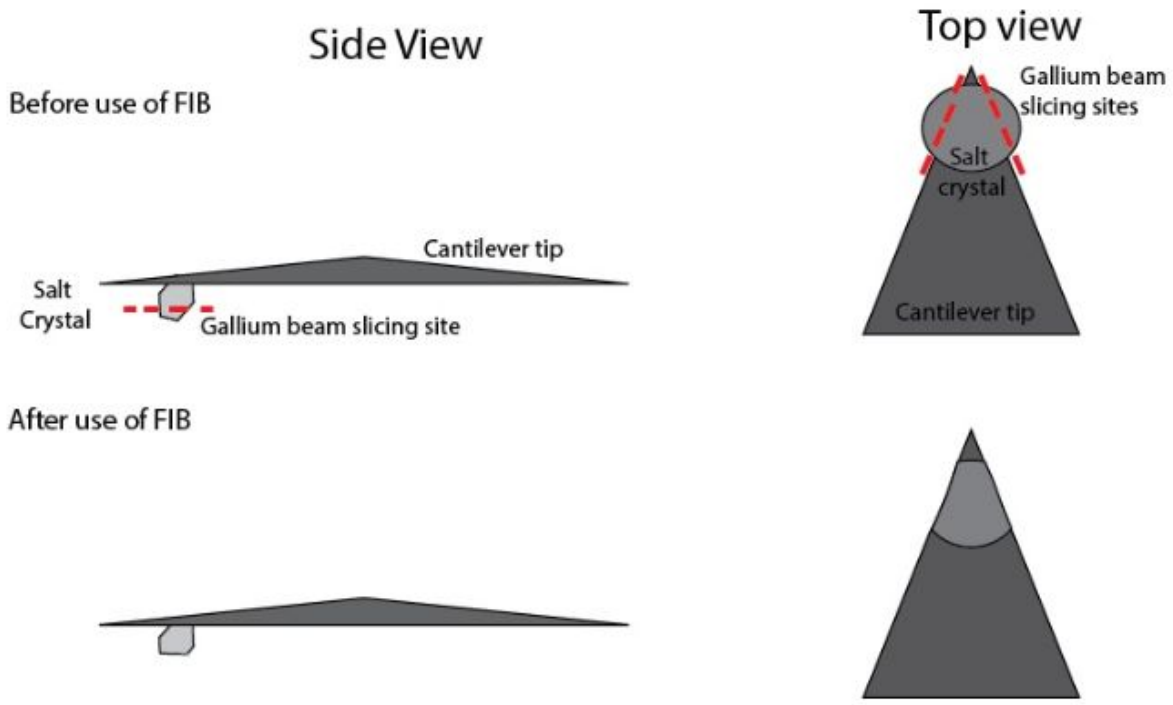

Figure S3: Side view (left) and top view (right) schematics of cutting salt microparticles using the Focused Ion Beam (FIB).

Figure S4

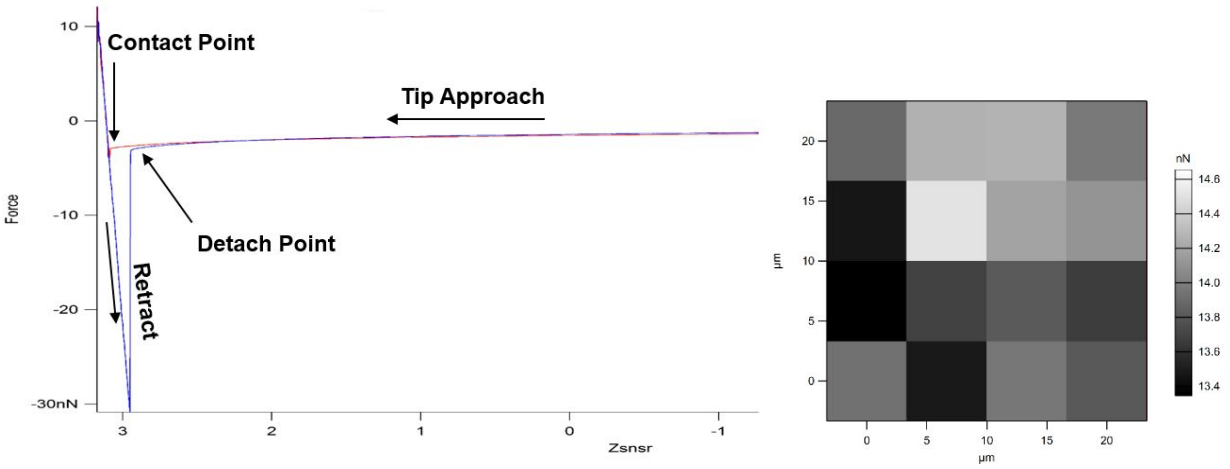

Figure S4: (Left) A representative force vs. deflection plot obtained during the adhesion force measurement using the molecular force probe (MFP). (Right) A representative map showing variation of the adhesion force measurements on sixteen different locations on a substrate.

Figure S5

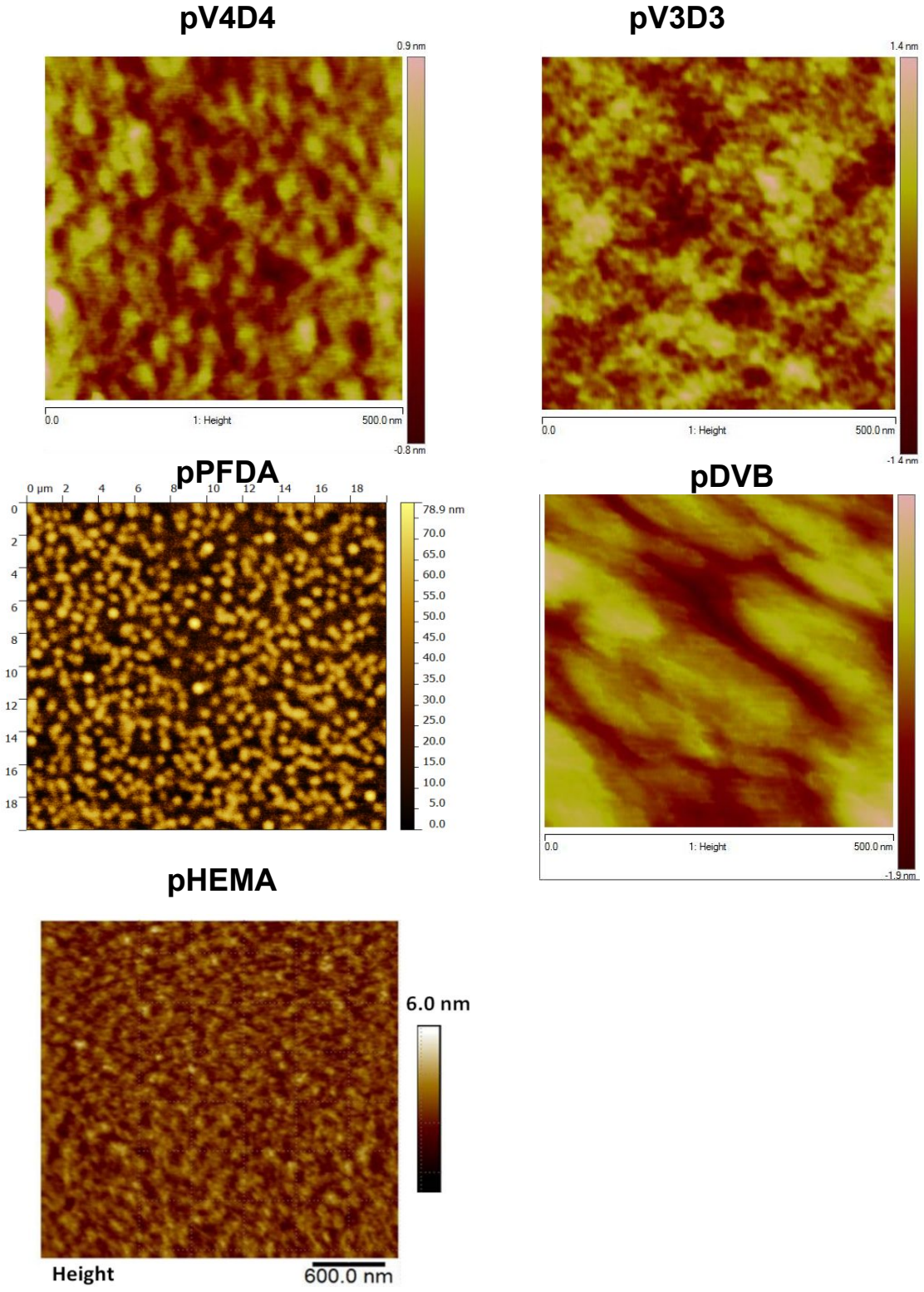

Figure S5: Atomic force microscopy (AFM) images of various polymer coatings on silicon substrates.

Figure S6

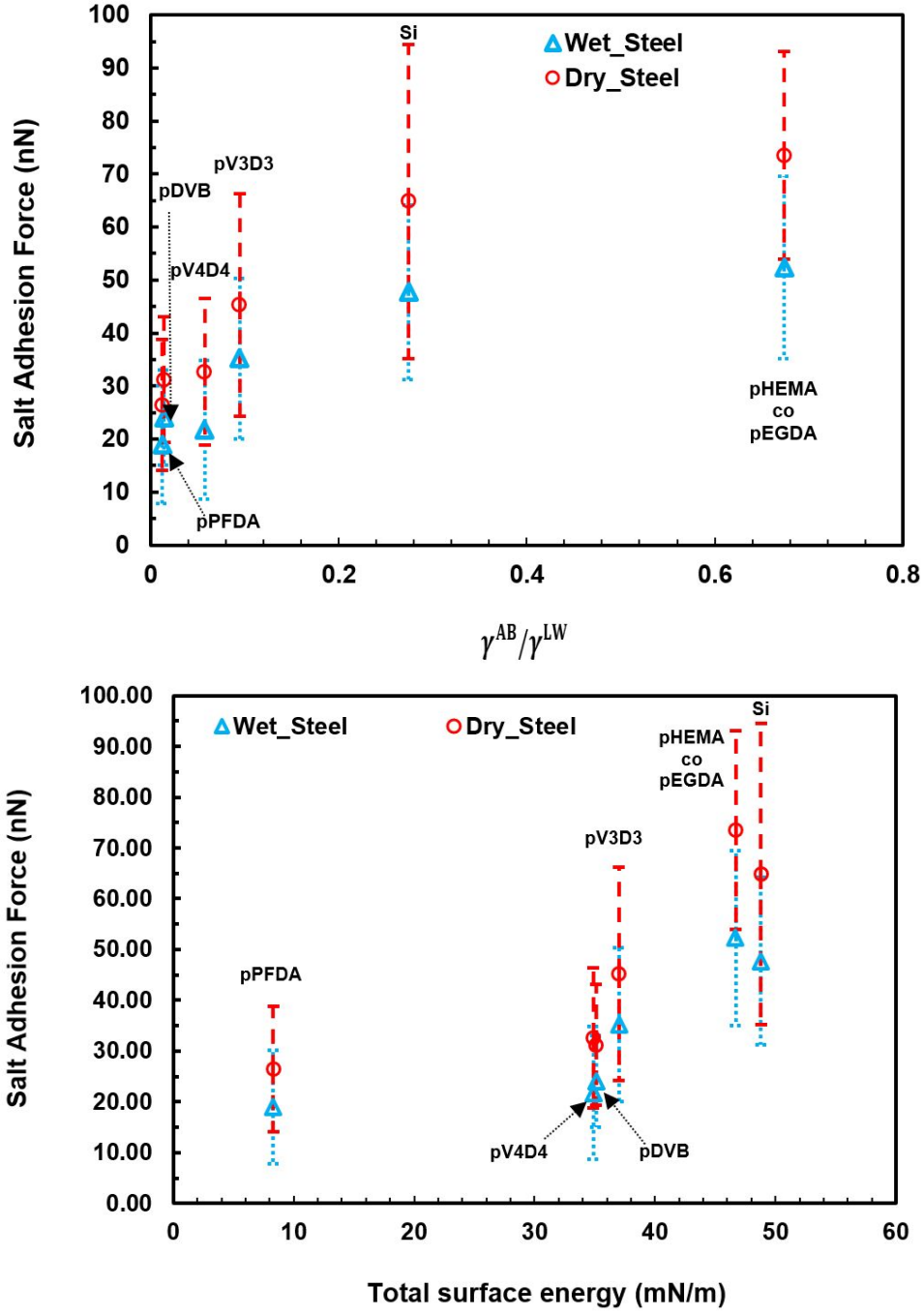

Figure S6 (Top) Adhesion force vs ratio of polar and apolar components of surface energies (bottom) adhesion forces vs total surface energy plots obtained from the molecular force probe (MFP) measurements in wet and dry conditions, averaged on sixteen different spots, on the bare, pHEMA-co-pEGDA, pV3D3, pV4D4, pDVB, and pPFDA-coated steel substrates.

Figure S7

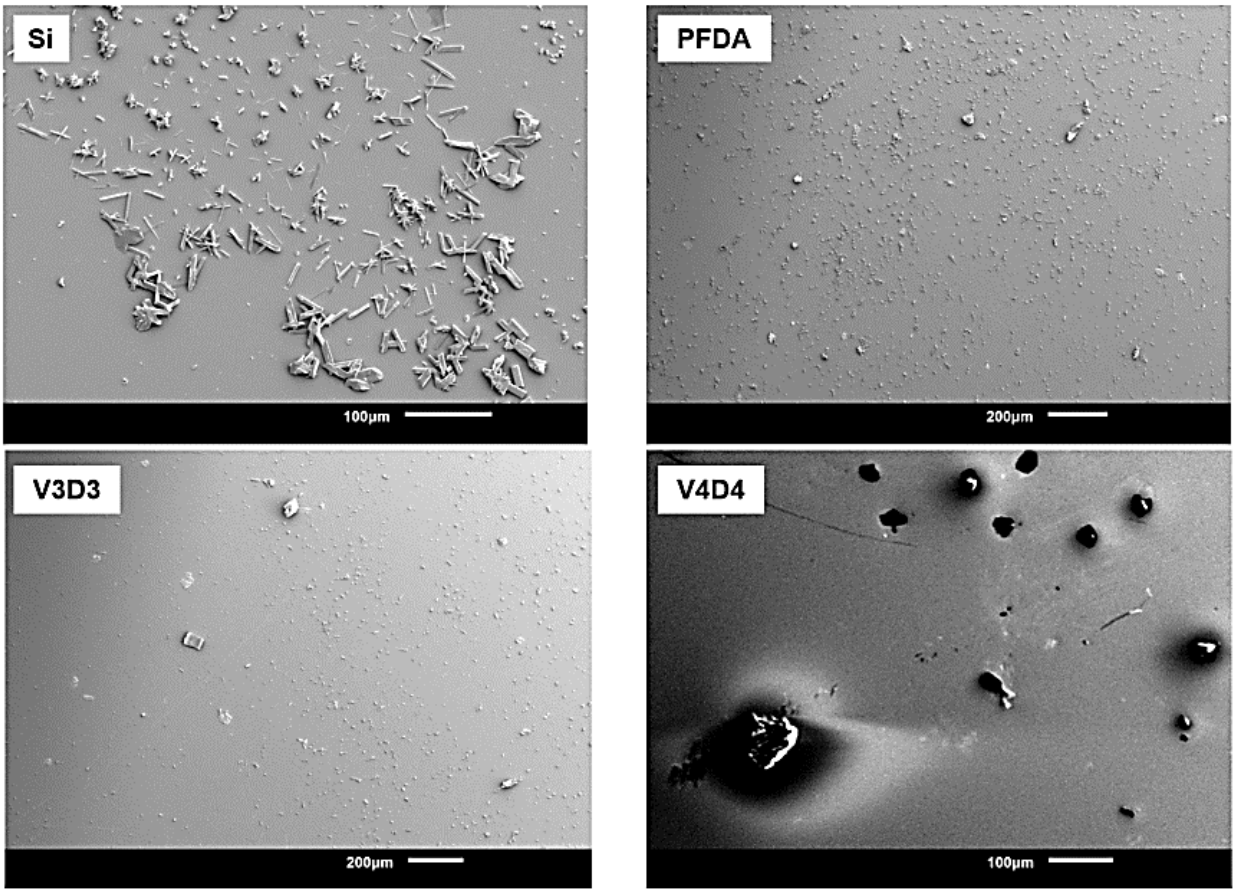

Figure S7: SEM images acquired ~ 30 minutes after performing the QCM-D experiments, passing supersaturated calcium sulfate dihydrate solution, on a bare silicon quartz crystal, pPFDA, pV3D3, and pV4D4-coated quartz crystals. SEM images show reduced presence of the calcium sulfate deposits on the polymer-coated substrates, mainly due to reduction of the surface energy by the coatings.