Electronic Supplementary Material (ESI) for Nanoscale Advances.


# Supporting Information

# Immunoglobulin Adsorption and Film Formation on Mechanically Wrinkled and Crumpled Surfaces at Submonolayer Coverage

Matthew T. Gole,[a] Mohan T. Dronadula,[b] Narayana R. Aluru,[b] Catherine J. Murphy[a*]

[a.] Department of Chemistry, University of Illinois Urbana-Champaign, Urbana, IL, 61801, USA

[b.] Walker Department of Mechanical Engineering, The University of Texas at Austin, Austin, Texas, 78712, USA

*Corresponding author: murphycj@illinois.edu

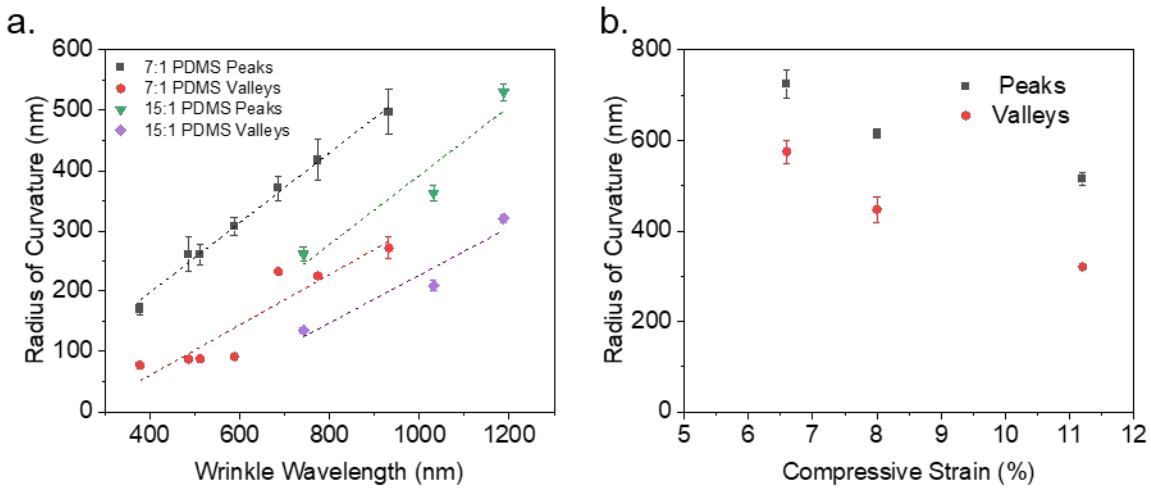


**Figure S1**. (**a**) Radii of curvature data from figure 1c with the addition of 3 samples fabricated with a PDMS base:curing agent ratio of 7:1. (**b**) Radii of curvature for 3 samples with wrinkle wavelength of 1200 nm under different degrees of compressive strain.

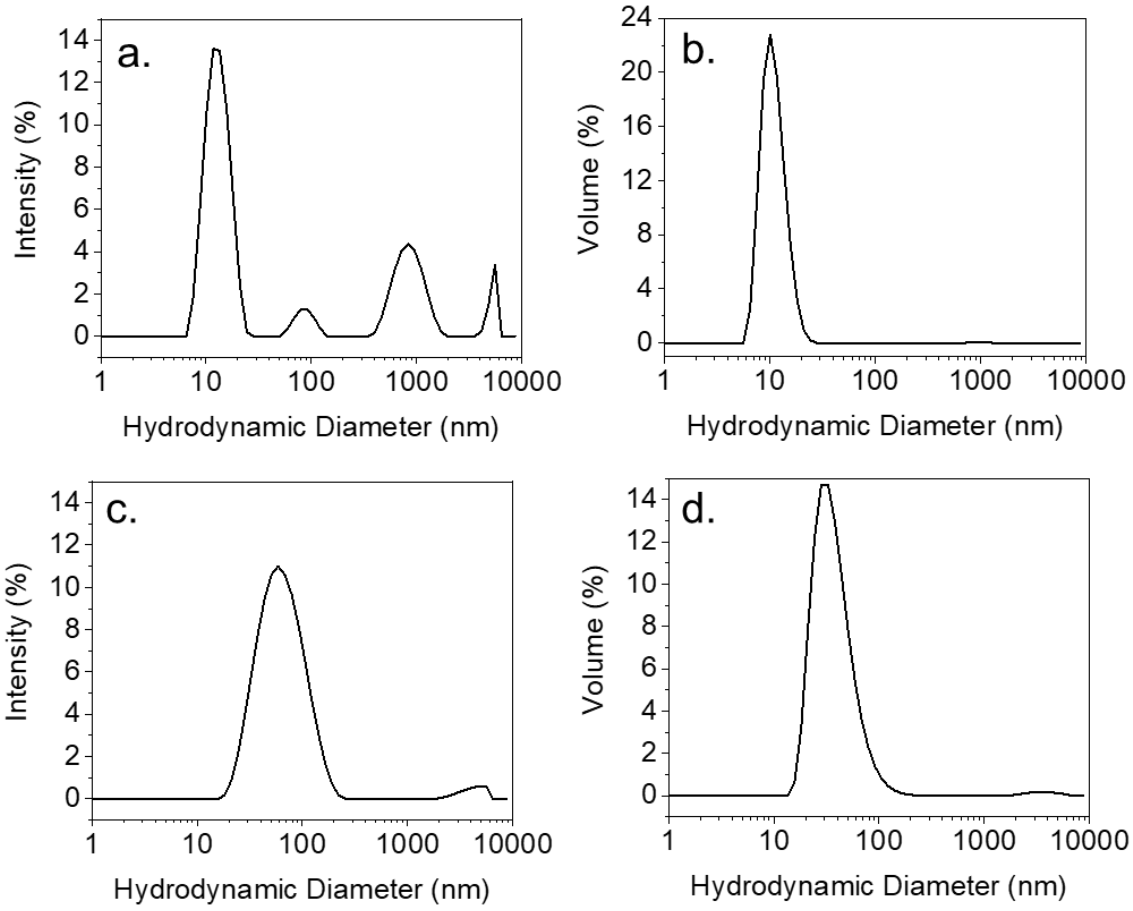


**Figure S2**. DLS distribution of IgG in intensity % (**a**) and volume % (**b**), and IgM in intensity % (**c**) and volume % (**d**). Though the presence of aggregates are detected by intensity %, these plots are skewed by higher sensitivity to large particles. Volume % plots are less sensitive to small amounts of aggregates and show the protein solutions are mainly single protein molecules.

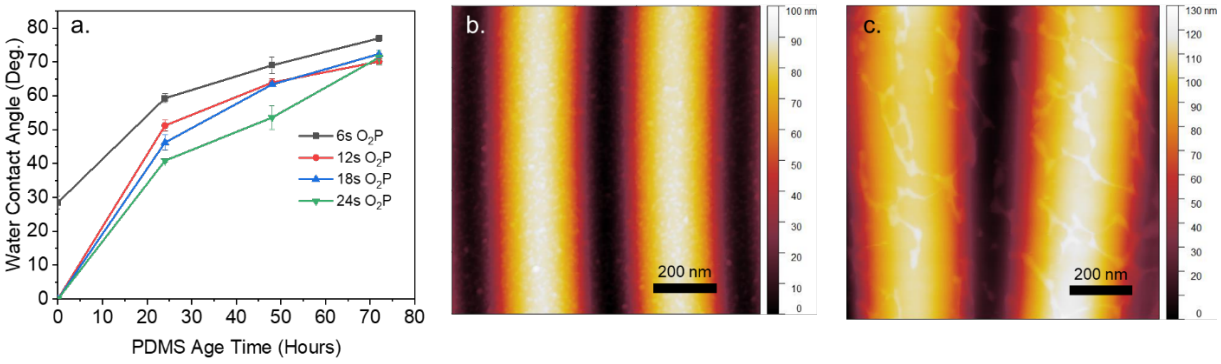


**Figure S3**. Evolution of water contact angle measurements of plasma treated PDMS samples over time since plasma treatment for different lengths of $O_2$ plasma ($O_2P$) (**a**). IgG adsorbed to a wrinkled PDMS sample within 3 hours of plasma treatment (**b**), and 3 days after plasma treatment (**c**). The fresh sample shows electrostatic stabilization of the protein, while the aged sample exhibits merging and network formation due to the hydrophobic effect.

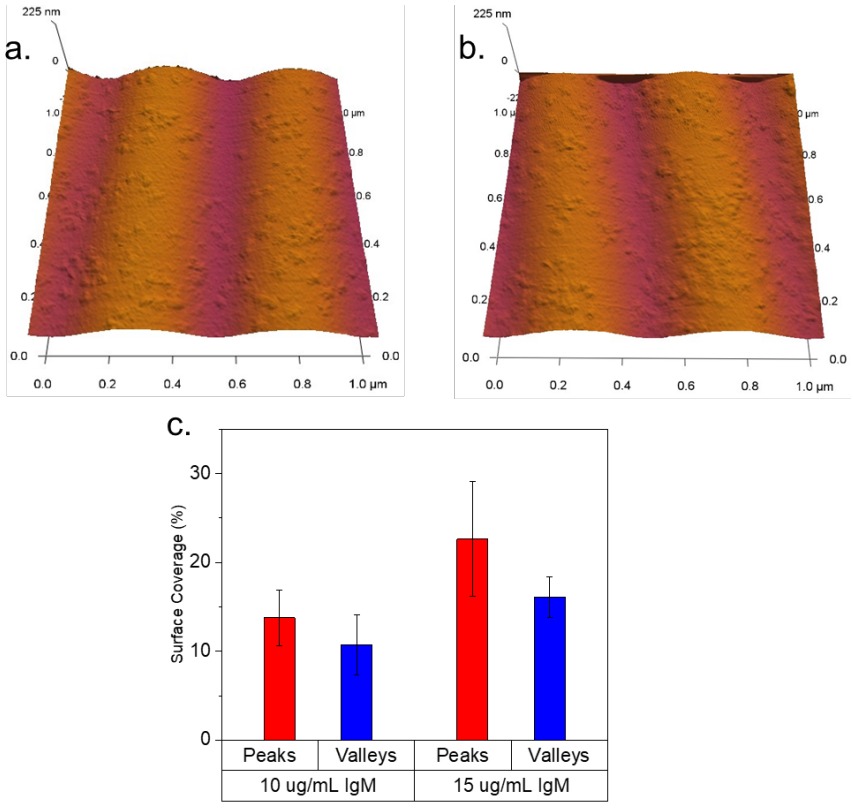


**Figure S4**. Liquid AFM topography of (**a**) 10 µg/mL and (**b**) 15 µg/mL IgM on wrinkled PDMS in 0.1 mM PBS buffer, pH 7.4. (**c**) Corresponding peak and valley surface coverages averaged over 3 images each.

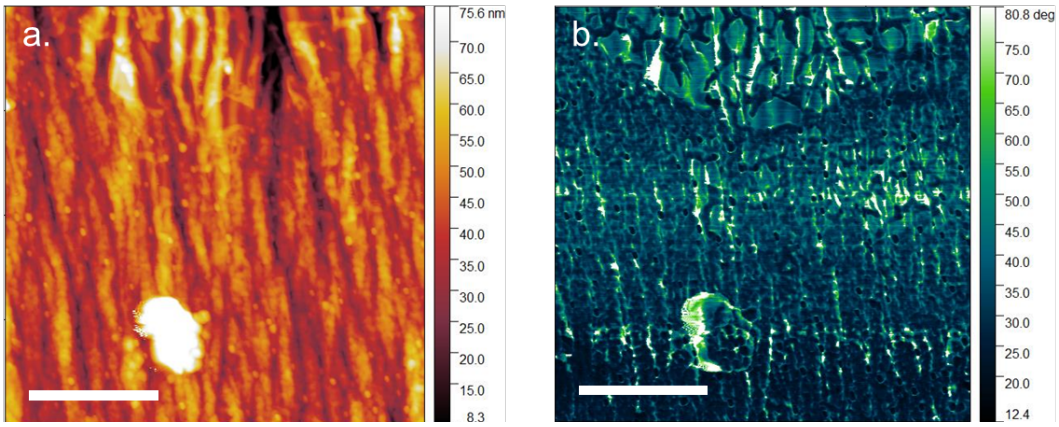


**Figure S5**. (**a**) AFM topography and (**b**) phase contrast of IgM adsorbed to crumpled graphene. Visible at the top of the image is protein network formation with a curved boundary, indicating a drying front with water thin film formation despite surface roughness. Scale bars 500 nm.

| | **Binding energy (E)** | **Energy differences (\|ΔE\|)** |
|---|---|---|
| **Concave** | -2869.1 ± 14 | 82.25 |
| **Flat** | -2786.85 ± 11 | |
| **Convex** | -2760.8 ± 9 | 26.05 |

**Table S1**. IgG/silica adsorption energies in kJ/mol. Energy differences (ΔE) were computed as the deviations with respect to the flat case.