Supporting Information

Charting the quantitative relationship between two-dimensional morphology parameters of polyamide membranes and synthesis conditions

Hyosung An,[a,b] John W. Smith,[a] Wenxiang Chen,[a,b] Zihao Ou,[a] and Qian Chen[a,b,c,d,*]

[a]Department of Materials Science and Engineering, [b]Materials Research Laboratory, [c]Department of Chemistry, [d]Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801, United States.

*To whom correspondence should be addressed. Email: qchen20@illinois.edu

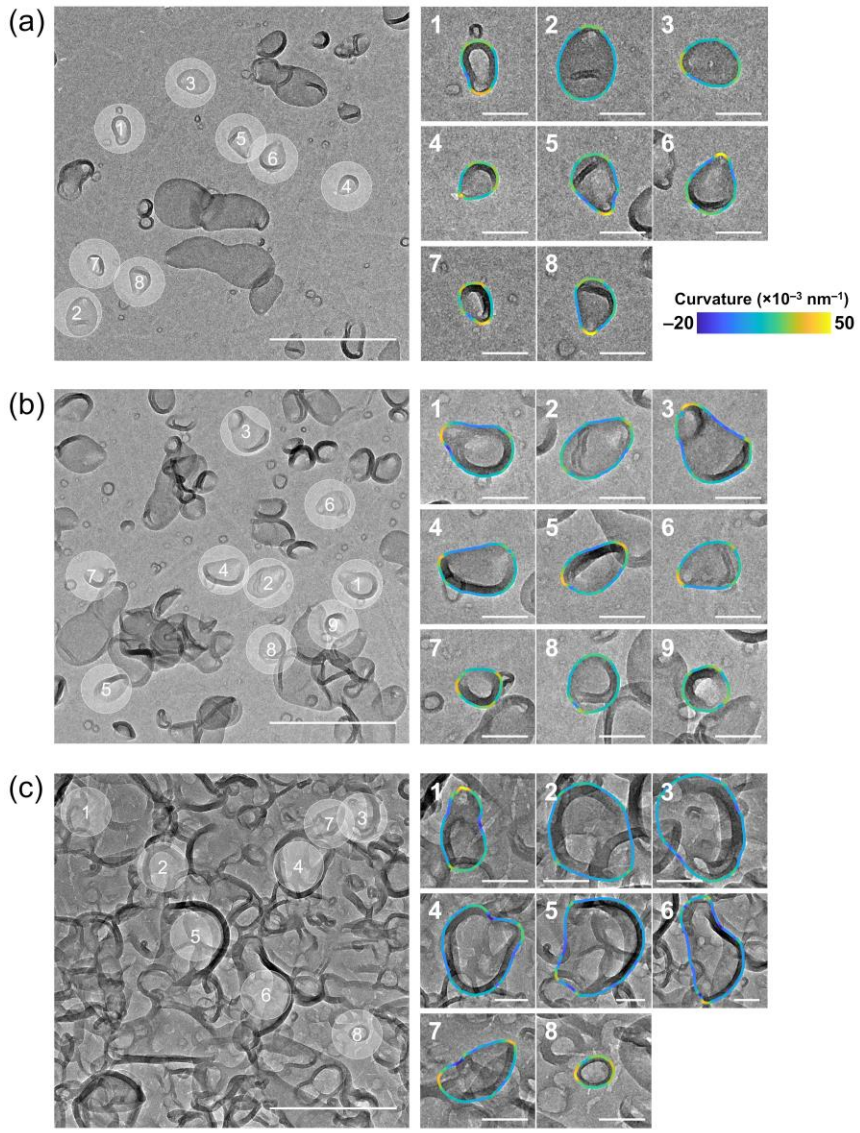

Fig. S1 (left) Low- and (right) high-magnification TEM images of polyamide membranes prepared with fixed c_{TMC} (0.05%) but varying (a) c_{MPD} of 1%, (b) c_{MPD} of 2%, and (c) c_{MPD} of 5%. TEM images are overlaid with surface contour colour-coded according to local surface curvature. Scale bars: 500 nm (left) and 100 nm (right).

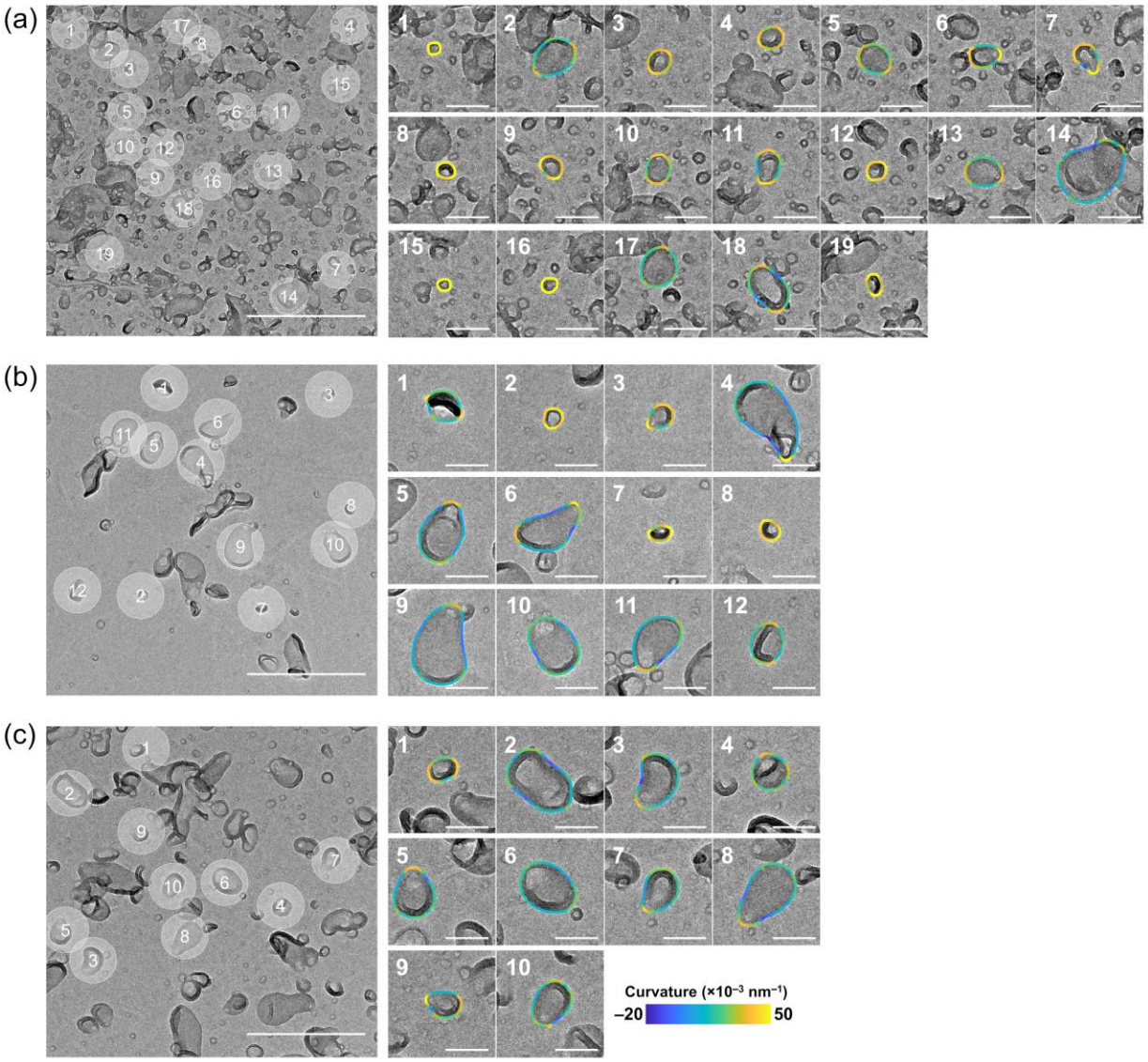

Fig. S2 (left) Low- and (right) high-magnification TEM images of polyamide membranes prepared with (a) c_{MPD} of 1% and c_{TMC} of 1% TMC, (b) c_{MPD} of 1% and c_{TMC} of 0.1%, and (c) c_{MPD} of 2% and c_{TMC} of 0.1%. TEM images are overlaid with surface contour colour-coded according to local surface curvature. Scale bars: 500 nm (left) and 100 nm (right).

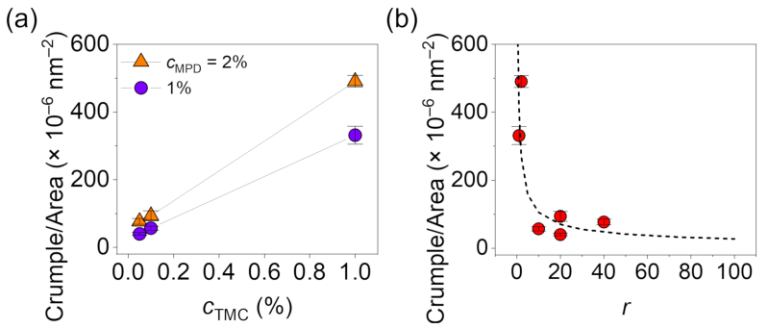

Fig. S3 Average number density of crumples as a function of (a) c_{TMC} and (b) the concentration ratio of MPD to TMC r. Error bars denote standard deviation. Crumple density increases with increasing c_{TMC}.

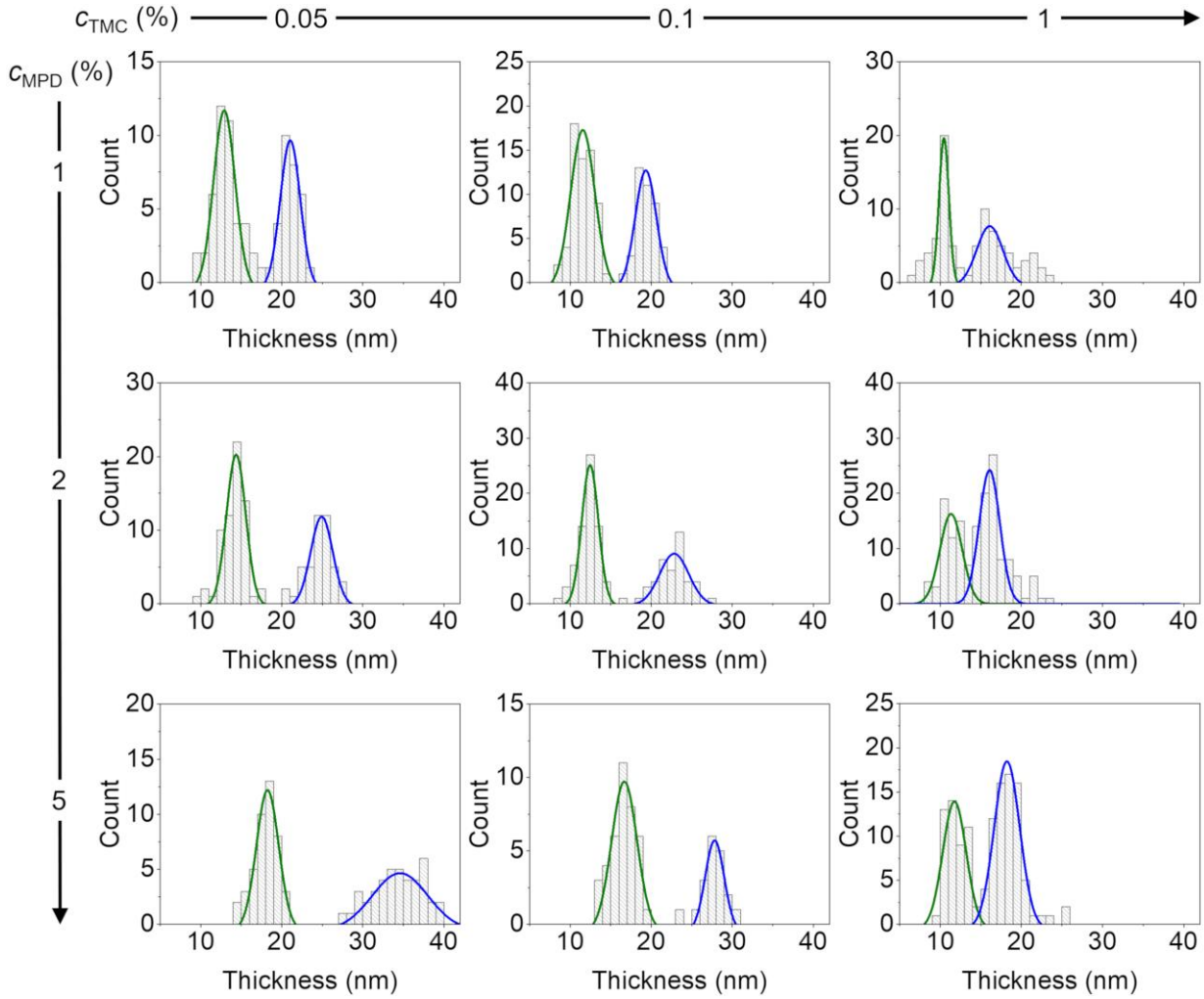

Fig. S4 Histograms of crumple thickness for polyamide membranes synthesized at different monomer concentrations as denoted by arrows.

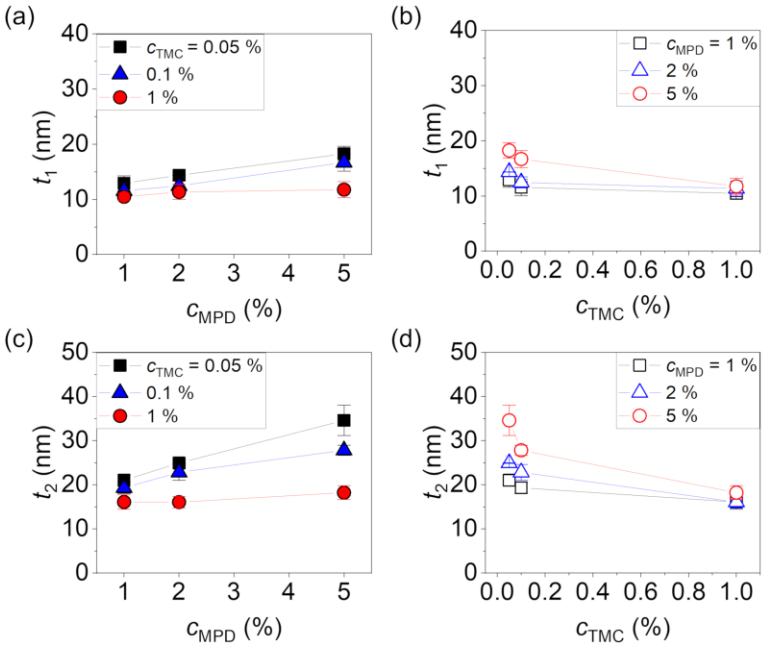

Fig. S5 Average crumple thickness of t_1 as a function of (a) c_{MPD} with fixed c_{TMC} (0.05%) and (b) c_{TMC} with fixed c_{MPD} (1%). Average crumple thickness of t_2 as a function of (c) c_{MPD} with fixed c_{TMC} (0.05%) and (d) c_{TMC} with fixed c_{MPD} (1%).

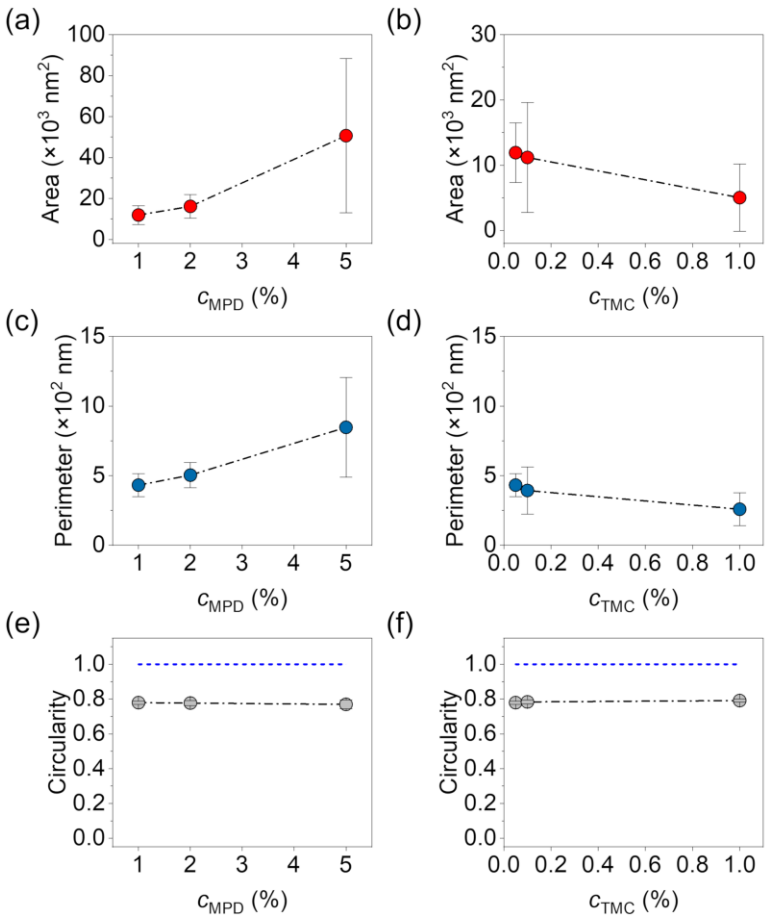

Fig. S6 Average projected area of crumples as a function of (a) c_{MPD} with fixed c_{TMC} (0.05%) and (b) c_{TMC} with fixed c_{MPD} (1%). Average perimeter of crumples as a function of (c) c_{MPD} with fixed c_{TMC} (0.05%) and (d) c_{TMC} with fixed c_{MPD} (1%). Average circularity of crumples as a function of (e) c_{MPD} with fixed c_{TMC} (0.05%) and (f) c_{TMC} with fixed c_{MPD} (1%). The black dot-dashed lines in (a-f) are guide to the eye. The dashed blue lines in (e) and (f) are the scaling of perfect circular shape (circularity = 1).

Table 1 Summary of the fitting equations from Fig. 5.

x	***y***	**Fitting eq.**	R^2
F_{max} (nm)	F_{min} (nm)	$y = 0.67x$	0.99
F_{max} (nm)	Curvature (μm^{-1})	$y = 3.1x^{-1.03}$	0.98
F_{max} (nm)	Perimeter (nm)	$y = (0.95)\pi x$	0.98
F_{max} (nm)	Area (nm^2)	$y = \pi(x/2.4)^2$	0.98