Electronic Supplementary Information for

Aqueous polypropylene glycol induces swelling and severe plasticization of high T_g amphiphilic copolymers containing hexafluoroisopropanol groups

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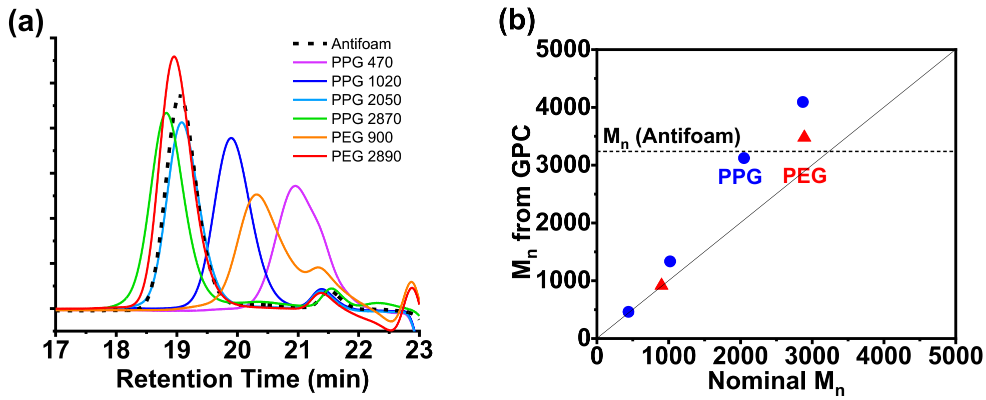

Figure S1. (a) GPC traces for Antifoam 204, PPG and PEG using THF as the effluent. The nominal molecular weight for the PPG and PEG is provided in the legend (in Da). (b) Comparison of nominal and experimental M_n from GPC (based on PS standards) for (●) PPG and (▲) PEG. The experimentally measured M_n exhibits a positive deviation from the nominal M_n for the higher molecular weights. For reference, the experimental M_n of Antifoam from GPC is shown by the horizontal dashed lines.

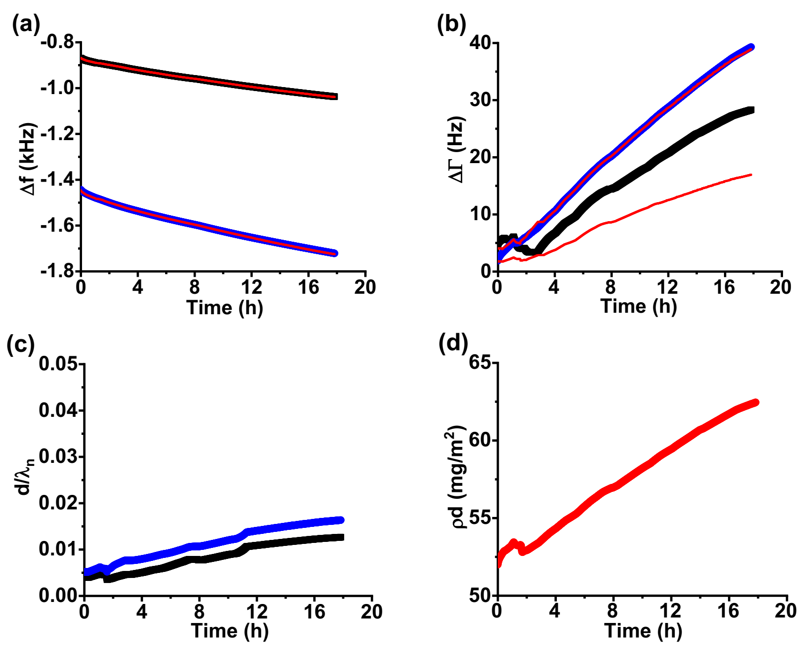

Figure S2. Time dependent QCM-D response for 44.0 nm BuNB-r-HFANB during swelling in 1 wt% n-butanol solution with 10 ppm of ethylene glycol. The experiment was stopped when the change in both Δf_3 and Δf_5 was < 6 Hz/h (defined as equilibrium). Measured (■, ●) and predicted values (■, ●) for the (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) Areal mass was determined from the fits of the frequency and dissipation to the power law model as shown by the red points. Predictions for rheological properties are not shown due to the low energy loss as determined by the normalized shear wavelength as shown in (c).

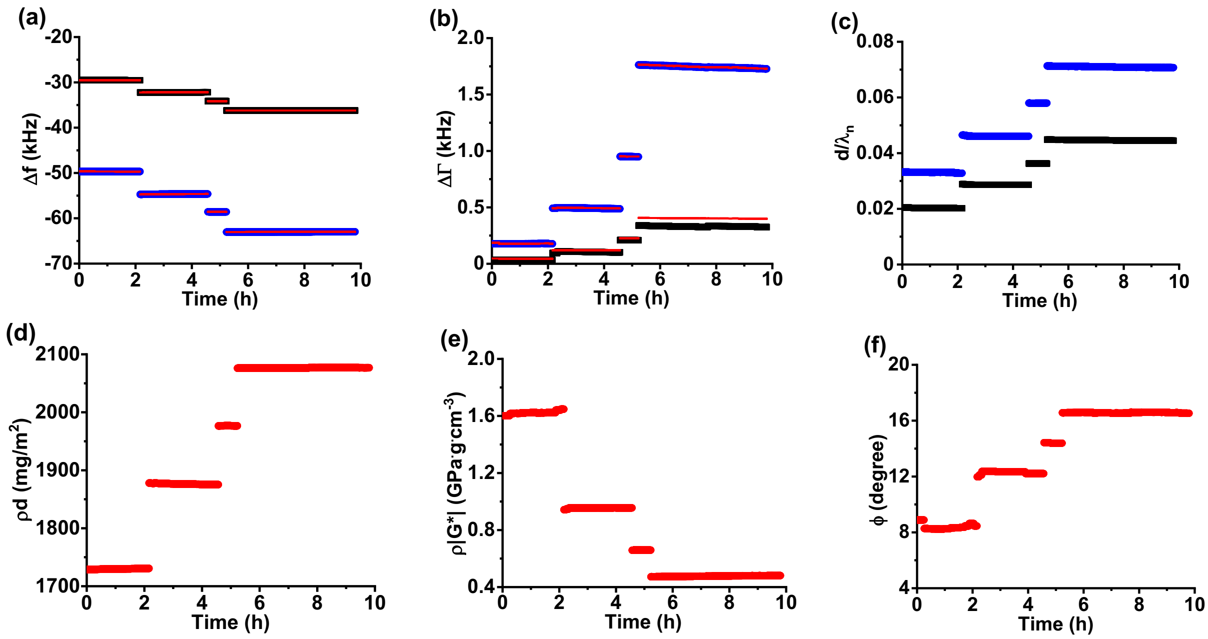

Figure S3. Time dependent QCM-D response for 1739 nm MeNB-r-HFANB when swelling in water and n-butanol solutions at concentration of 1 wt%, 2 wt%, and 3 wt% n-butanol. The experiment was stopped when the change in both Δf_3 and Δf_5 was < 6 Hz/h (defined as equilibrium). Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

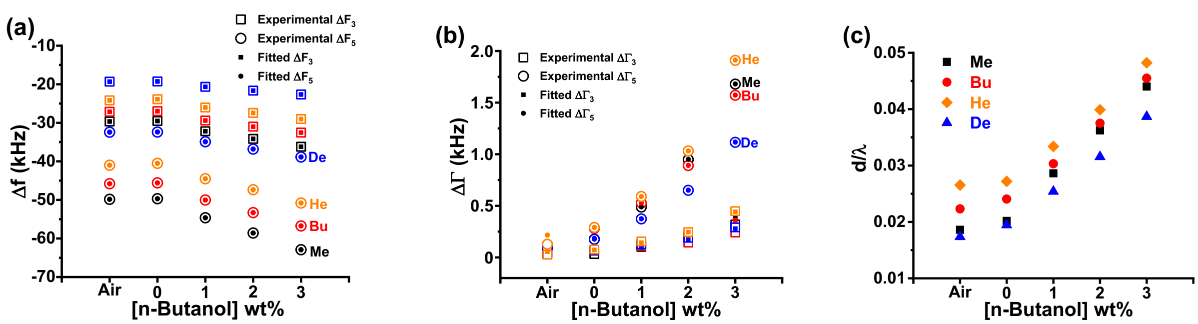

Figure S4. Measured (open symbols) and fits (closed symbols) of the (a) frequency and (b) dissipation changes from QCM-D at equilibrium for the films swollen by n-butanol solutions. (c) Ratio of thickness to acoustic shear wavelength for the different RNB-r-HFANB (R=Me, Bu, He, De) films. This ratio provides insight into suitability of the fits for reporting rheological properties. These films are near the lower limit of energy loss to obtain rheological properties.

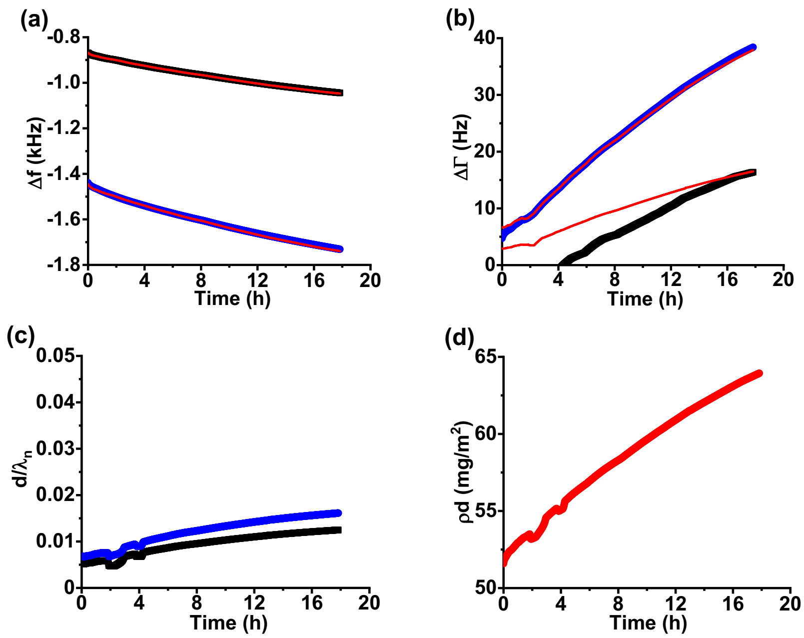

Figure S5. Time dependent QCM-D response for 42.8 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of PEG (M_n = 370 g/mol). The experiment was stopped when the change in both Δf_3 and Δf_5 was < 6 Hz/h (defined as equilibrium). Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) Areal mass was determined from the fits of the frequency and dissipation to the power law model as shown by the red points. Predictions for rheological properties are not shown due to the low energy loss as determined by the normalized shear wavelength as shown in (c).

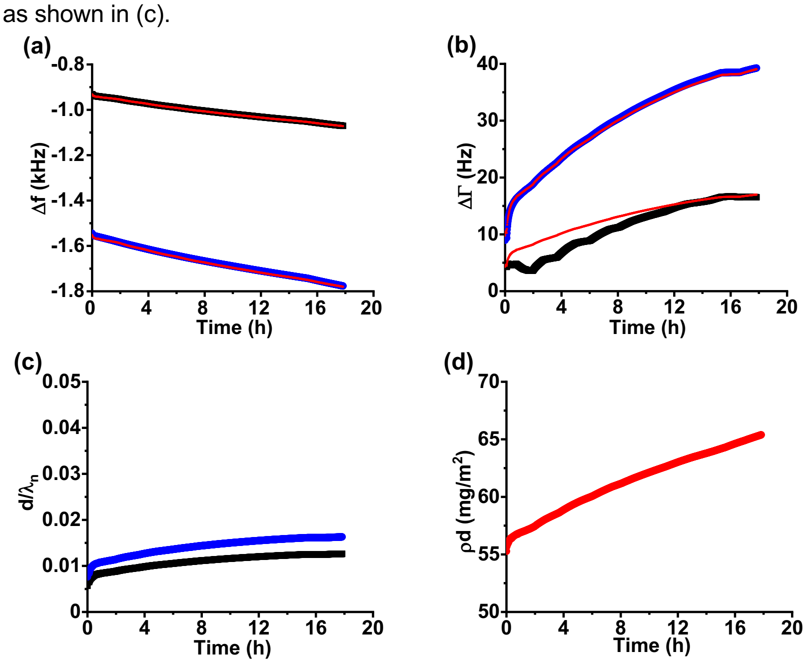

Figure S6. Time dependent QCM-D response for 46.8 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PEG (M_n = 915 g/mol). The experiment was stopped when the change in both Δf_3 and Δf_5 was < 6 Hz/h (defined as equilibrium). Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) Areal mass was determined from the fits of the frequency and dissipation to the power law model as shown by the red points. Predictions for rheological properties are not shown due to the low energy loss as determined by the normalized shear wavelength as shown in (c).

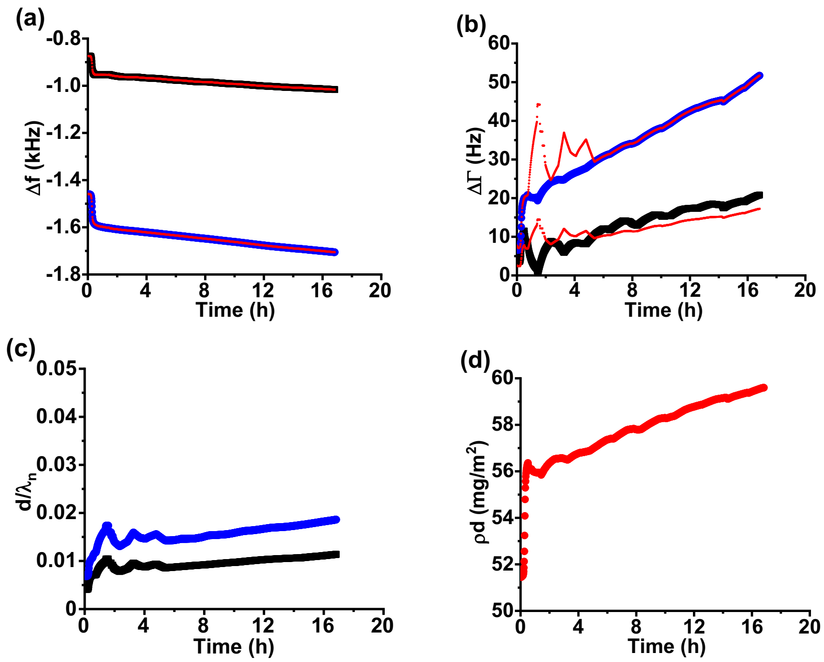

Figure S7. Time dependent QCM-D response for 42.8 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of PEG (M_n = 3479 g/mol). The experiment was stopped when the change in both Δf_3 and Δf_5 was < 6 Hz/h (defined as equilibrium). Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) Areal mass was determined from the fits of the frequency and dissipation to the power law model as shown by the red points. Predictions for rheological properties are not shown due to the low energy loss as determined by the normalized shear wavelength as shown in (c).

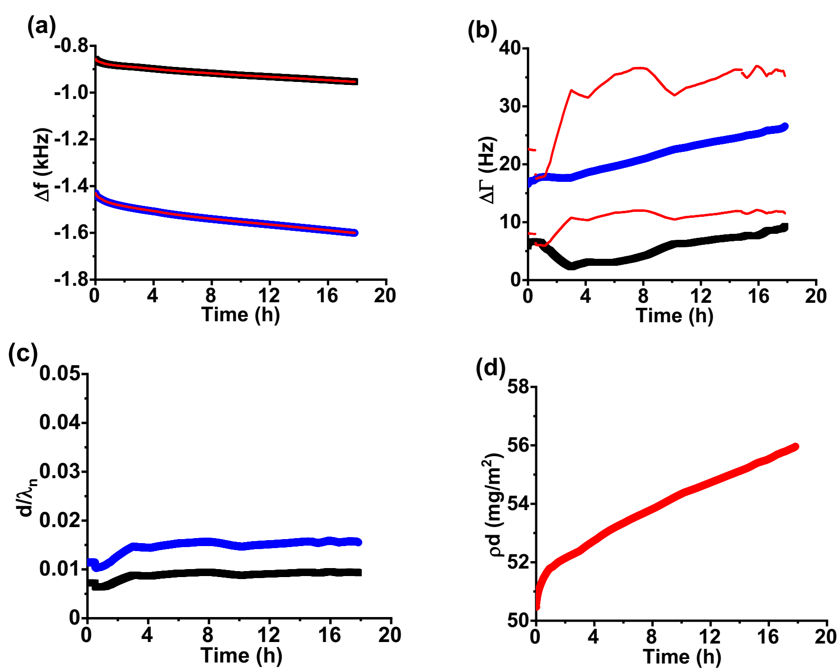

Figure S8. Time dependent QCM-D response for 41.0 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of propylene glycol until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) Areal mass was determined from the fits with the power law model. Predictions for rheological properties are not shown due to the low energy loss.

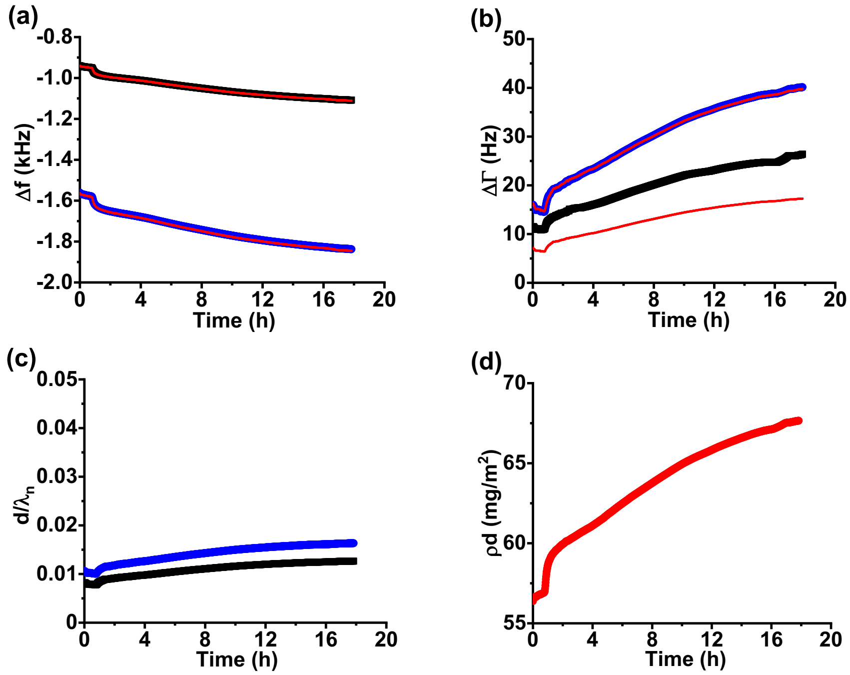

Figure S9. Time dependent QCM-D response for 47.0 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of PPG (M_n = 461 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with power law model. Predictions for rheological properties are not shown due to the low energy loss.

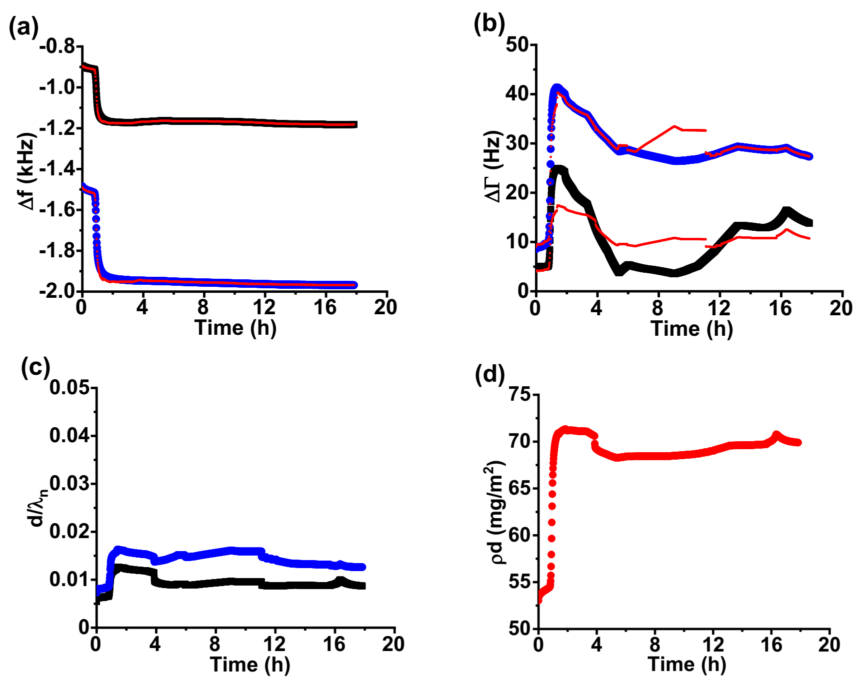

Figure S10. Time dependent QCM-D response for 43.6 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of PPG (M_n = 1334 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Predictions for rheological properties are not shown due to the low energy loss.

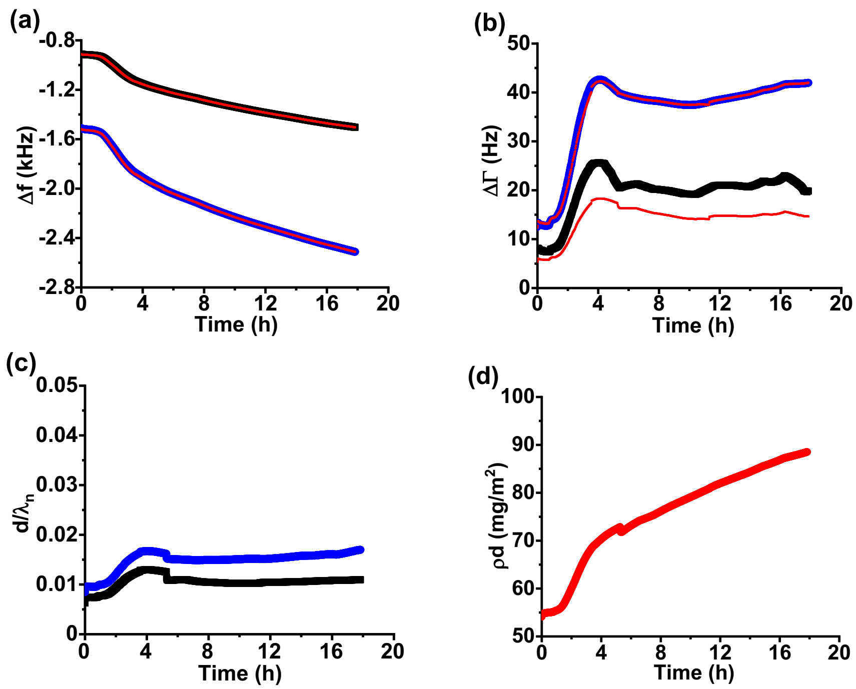

Figure S11. Time dependent QCM-D response for 44.7 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of PPG (M_n = 4093 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Predictions for rheological properties are not shown due to the low energy loss.

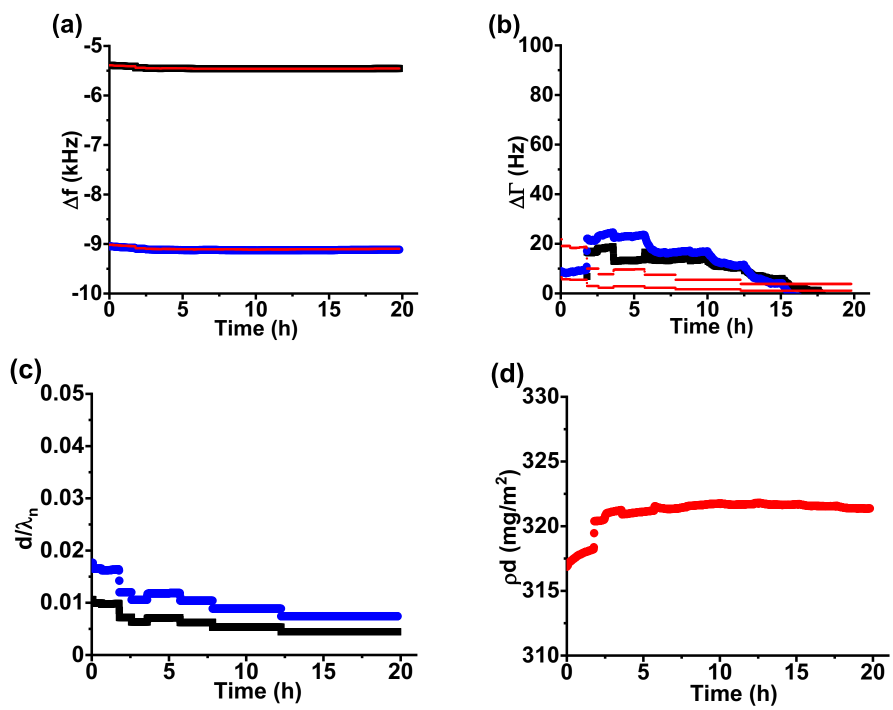

Figure S12. Time dependent QCM-D response for 267.9 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of propylene glycol until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) Areal mass was determined from fits of the frequency and dissipation with the power law model. Predictions for rheological properties are not shown due to the low energy loss.

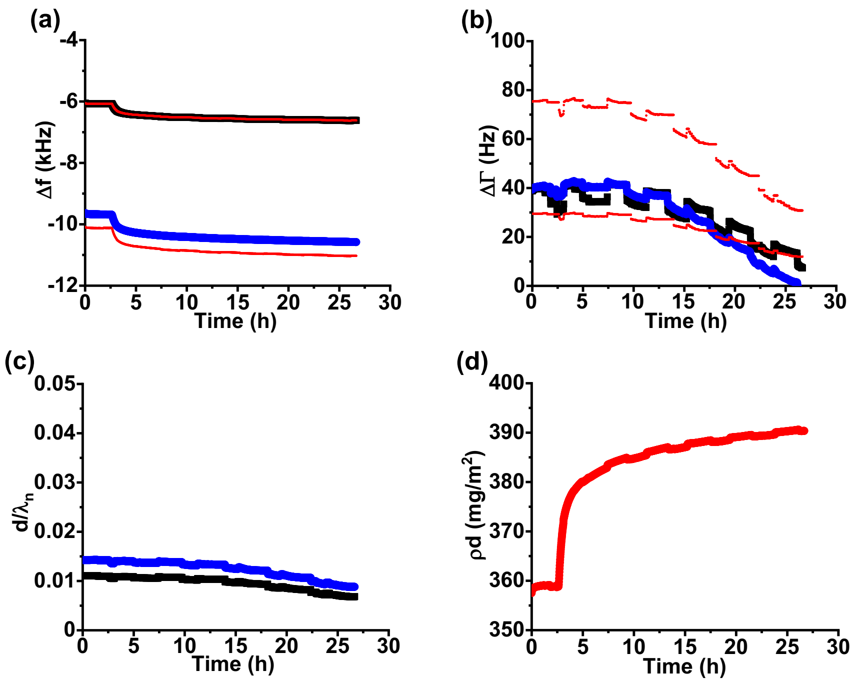

Figure S13. Time dependent QCM-D response for 307.3 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 461 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

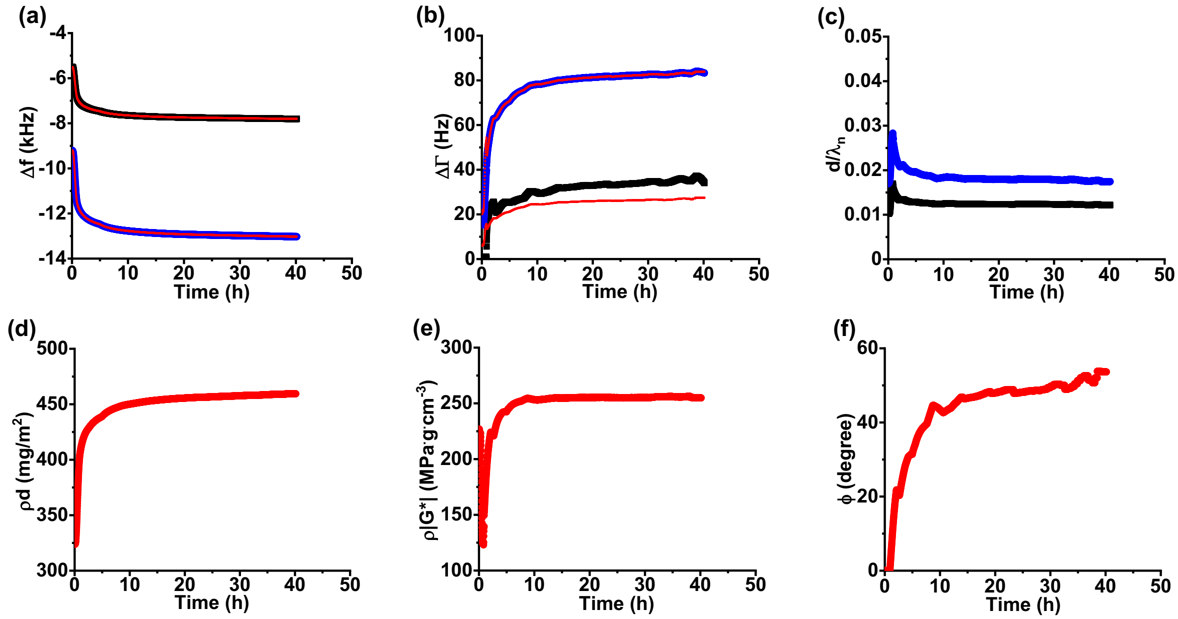

Figure S14. Time dependent QCM-D response for 276.8 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 1334 g/mol) until change in both Δf_3 and Δf_5 < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) Areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

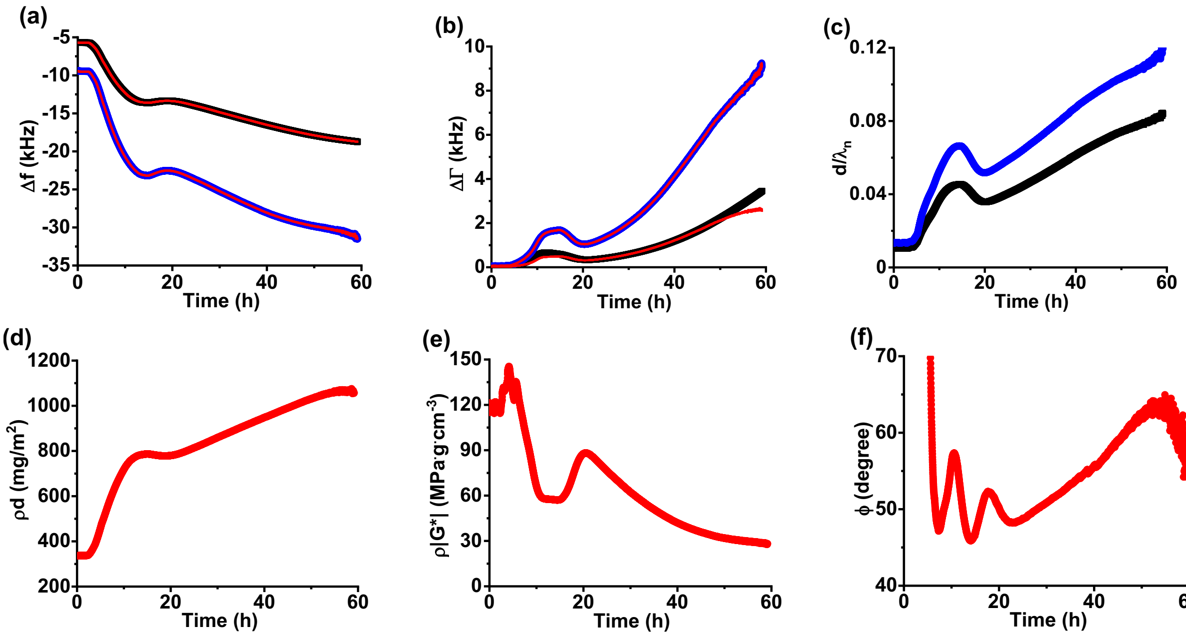

Figure S15. Time dependent QCM-D response for 295.7 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 3122 g/mol) until signals for f_5 and Γ_5 are lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

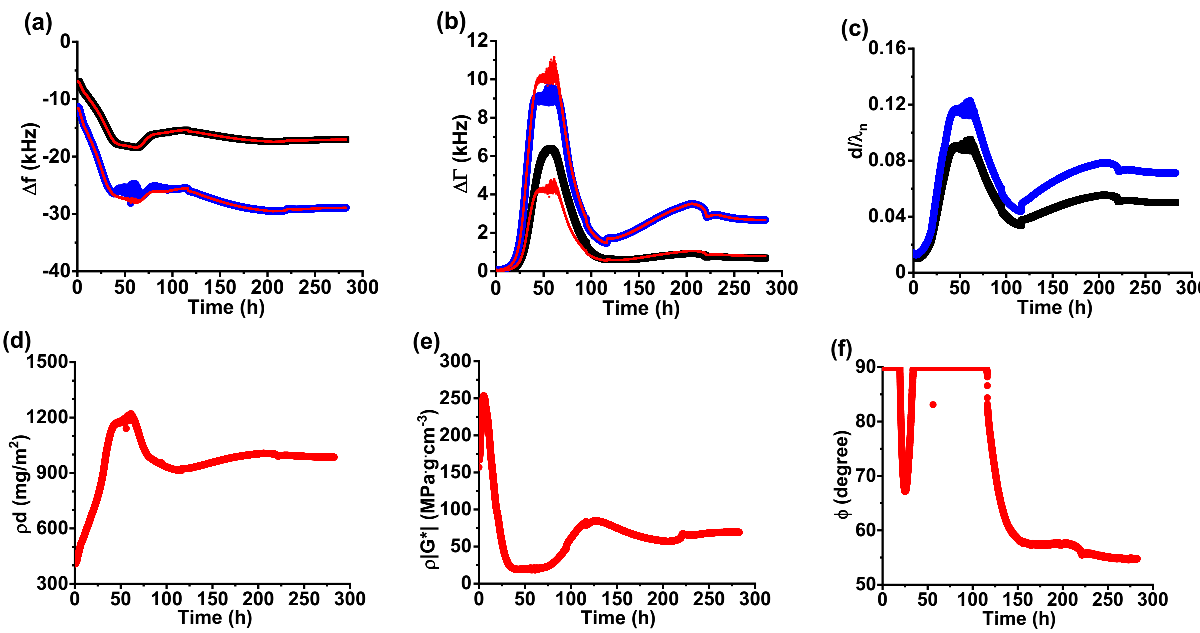

Figure S16. Time dependent QCM-D response for 360.7 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n= 4093 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) for 3rd and 5th overtone, respectively, of (a) frequency shifts, (b) dissipation change, and (c) ratios of thickness to acoustic shear wavelength, d/λ_n. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

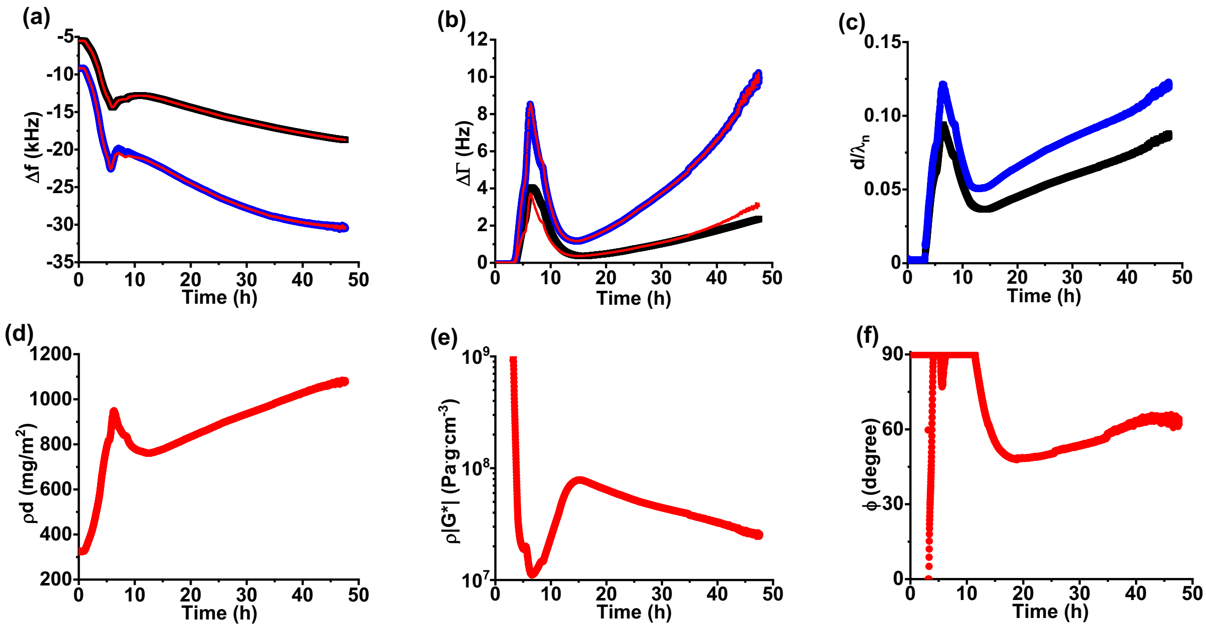

Figure S17. Time dependent QCM-D response for 295.8 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of Antifoam 204 (M_n = 3238 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, and (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

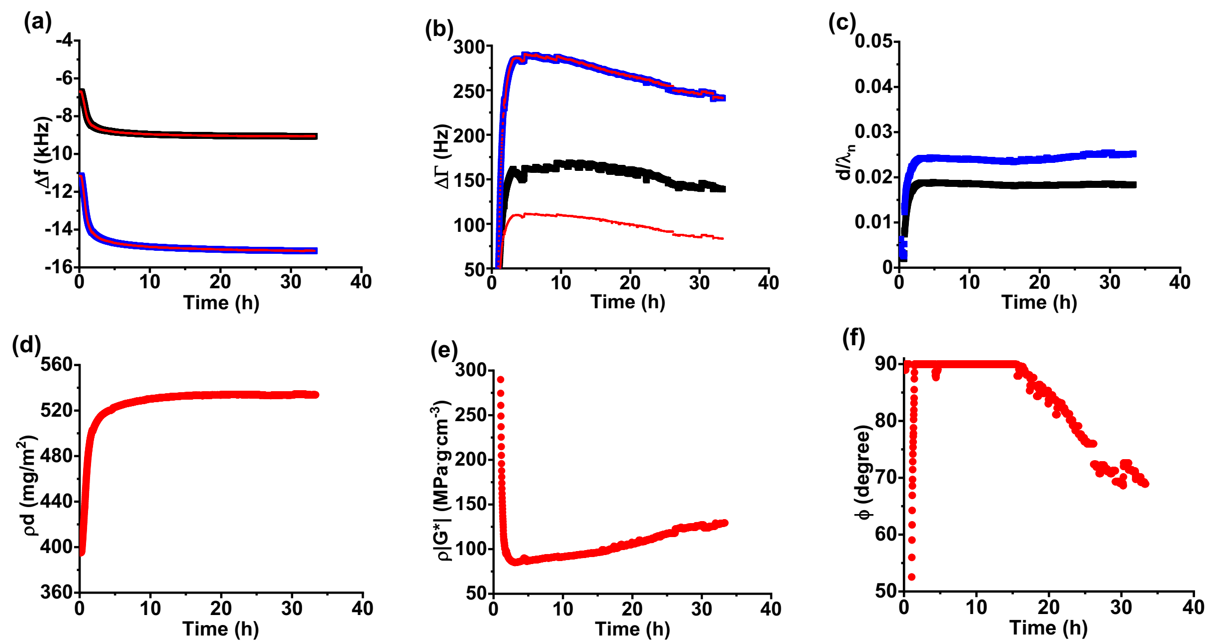

Figure S18. Time dependent QCM-D response for 363.9 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 1334 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

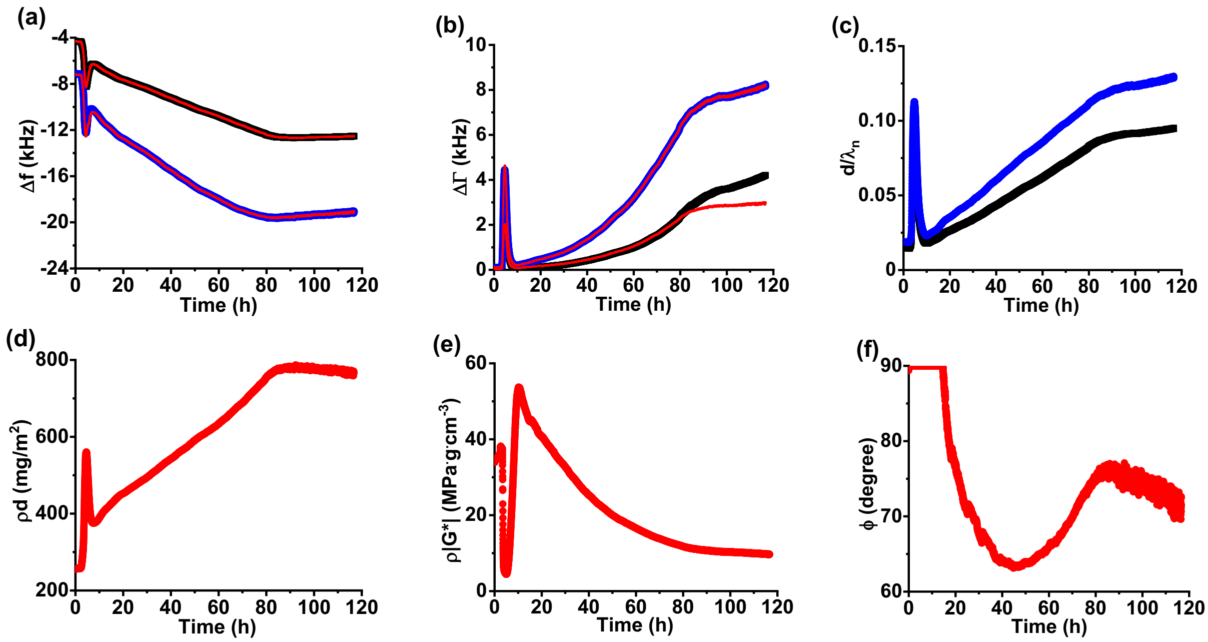

Figure S19. Time dependent QCM-D response for 203.4 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 3122 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

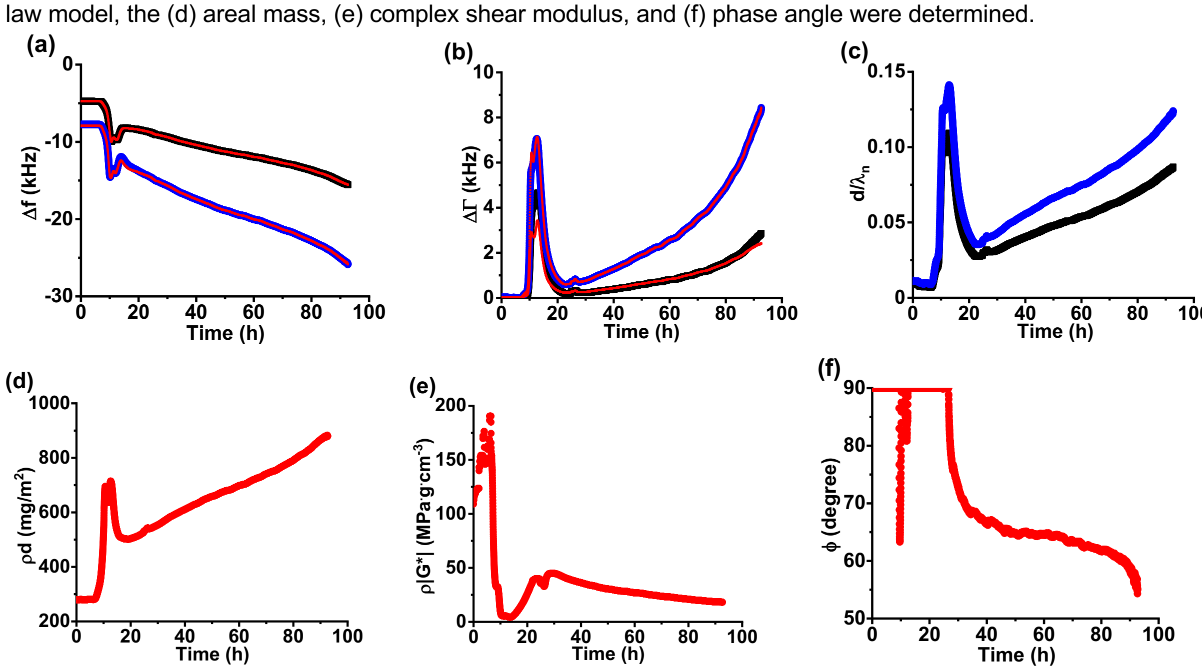

Figure S20. Time dependent QCM-D response for 257.6 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 3122 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

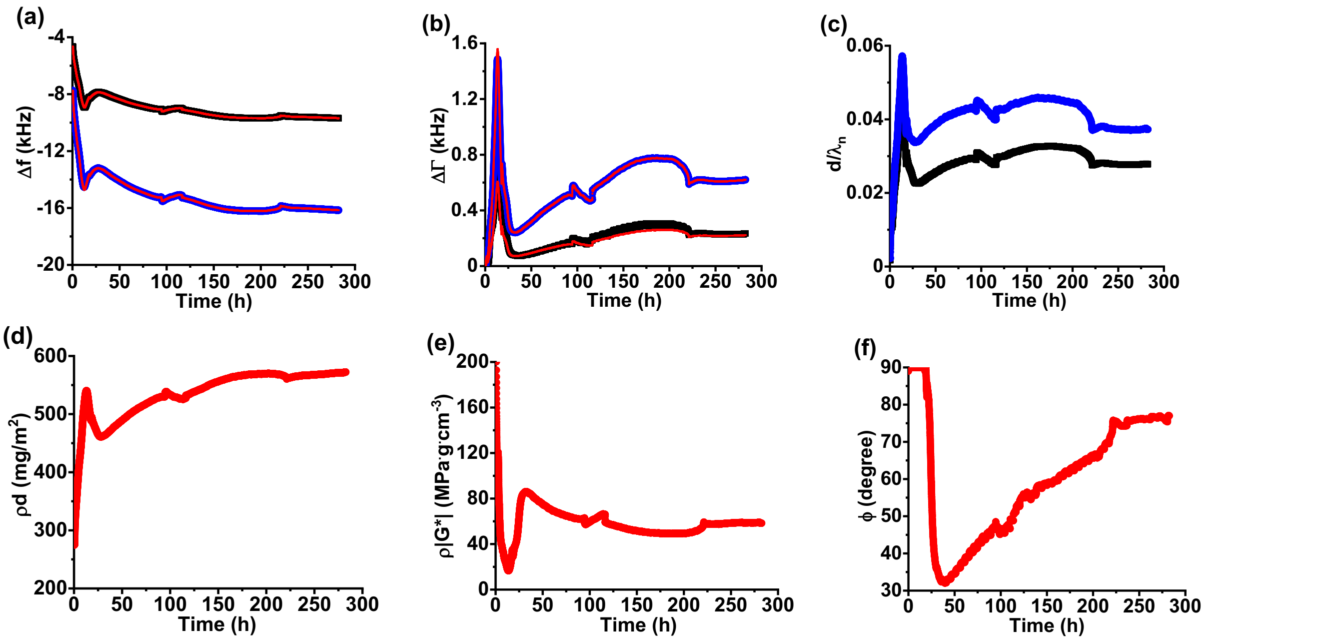

Figure S21. Time dependent QCM-D response for 252.9 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 4093 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3^{rd} and 5^{th} overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

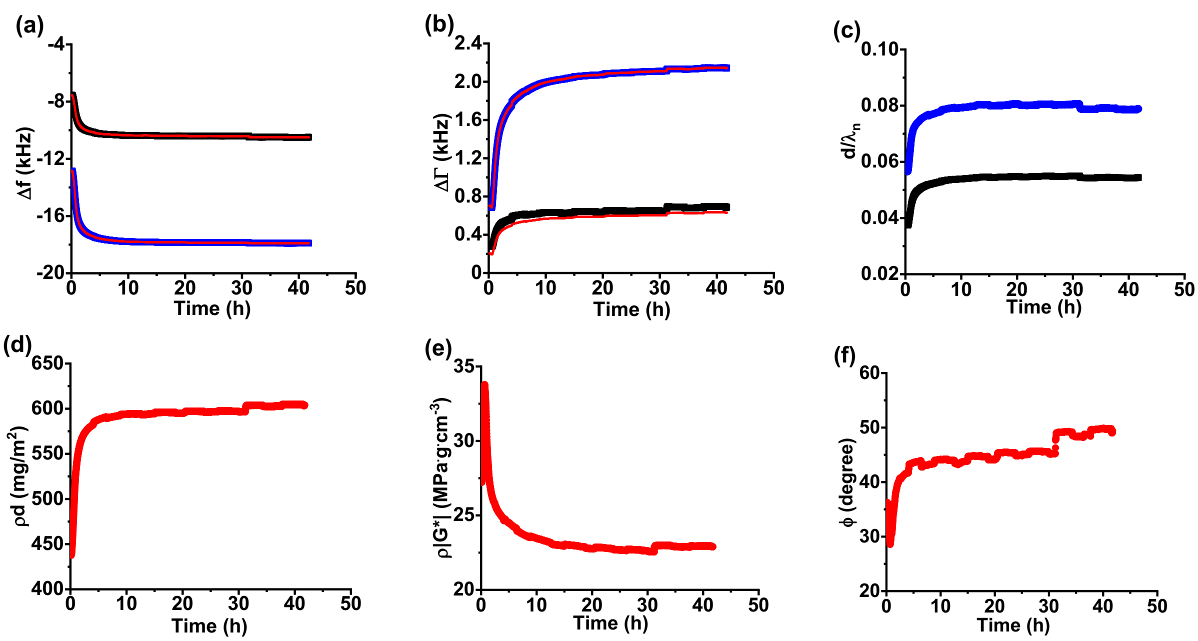

Figure S22. Time dependent QCM-D response for 327.2 nm HeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 1334 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3^{rd} and 5^{th} overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

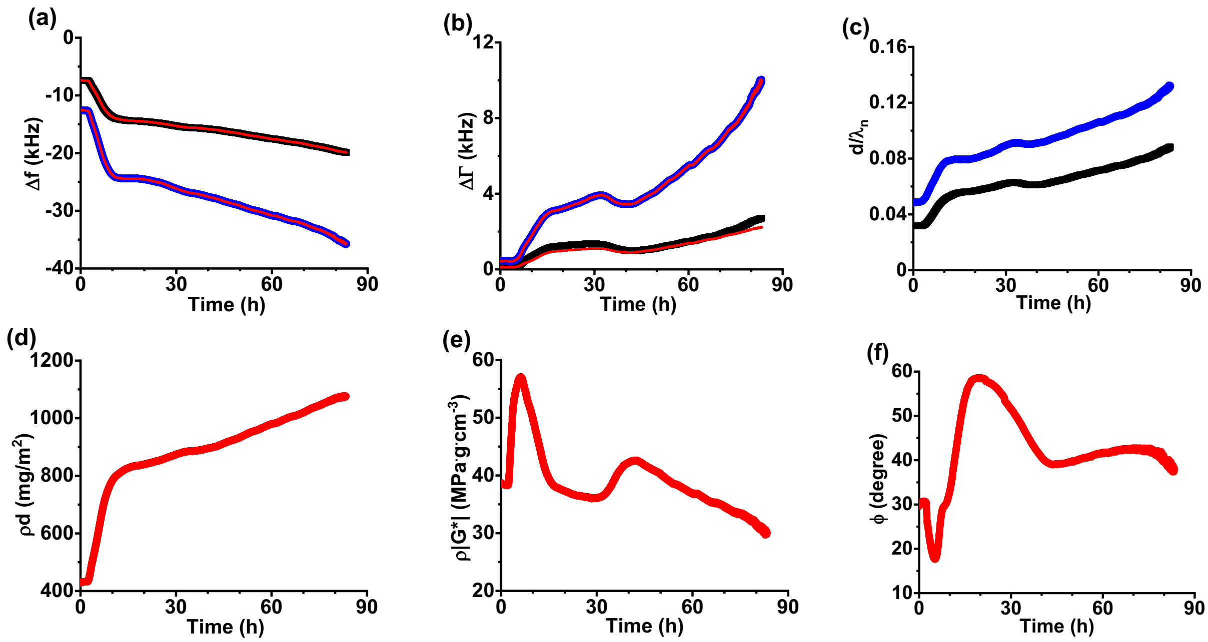

Figure S23. Time dependent QCM-D response for 317.3 nm HeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 3122 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

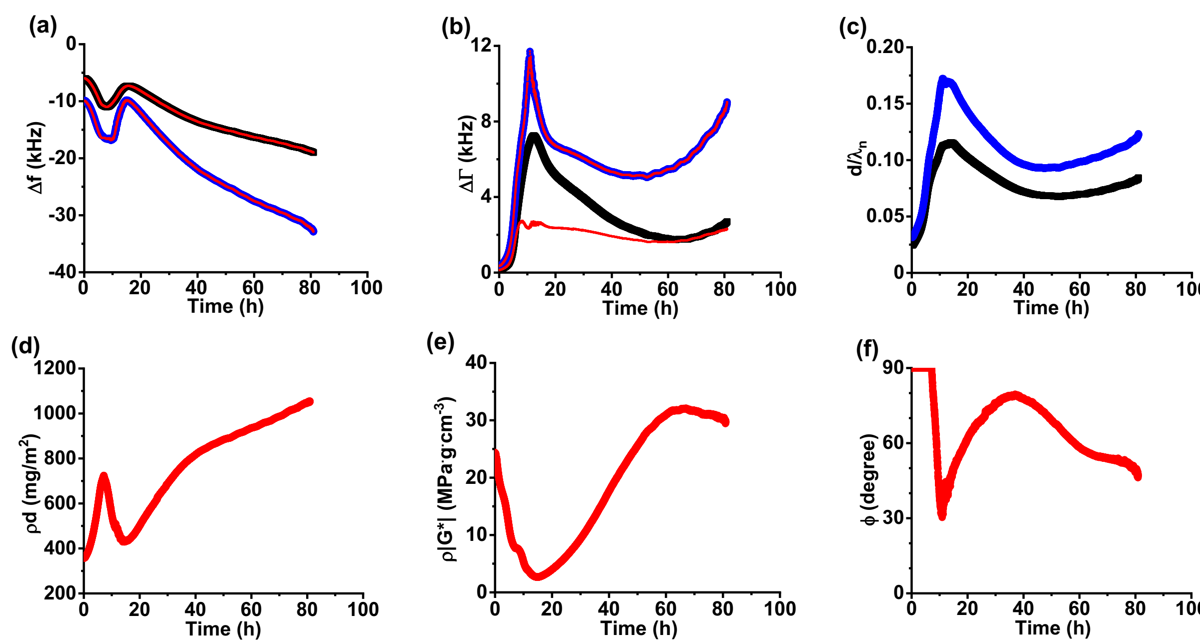

Figure S24. Time dependent QCM-D response for 300.1 nm HeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of PPG (M_n = 3122 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

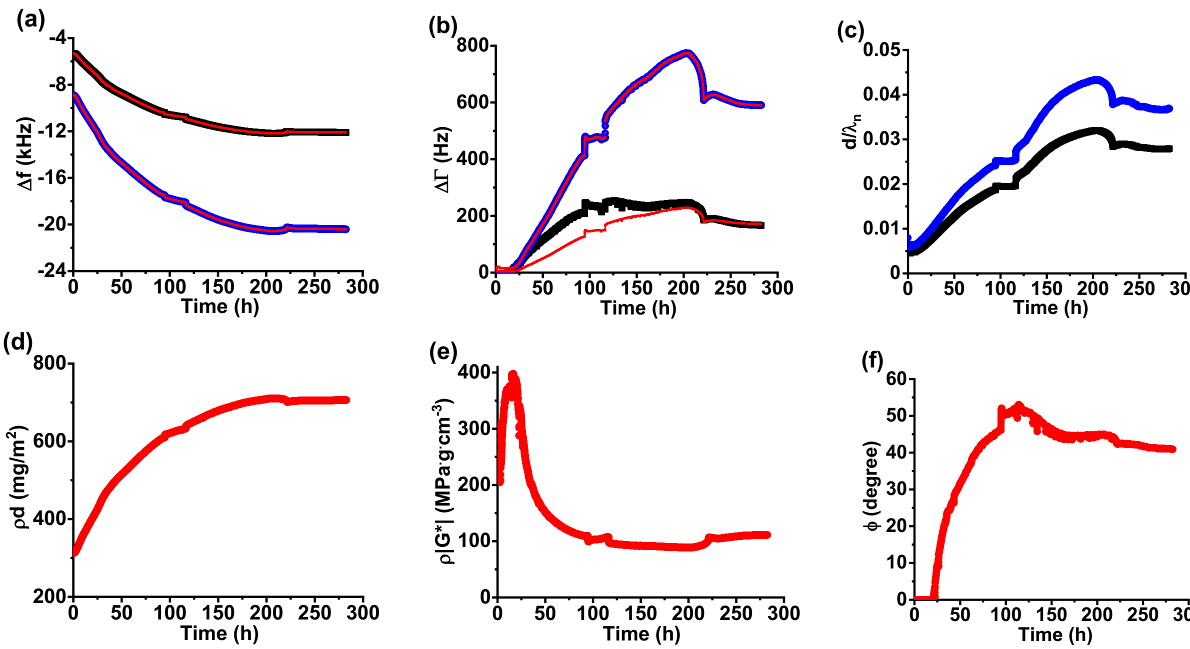

Figure S25. Time dependent QCM-D response for 291.2 nm HeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 4093 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

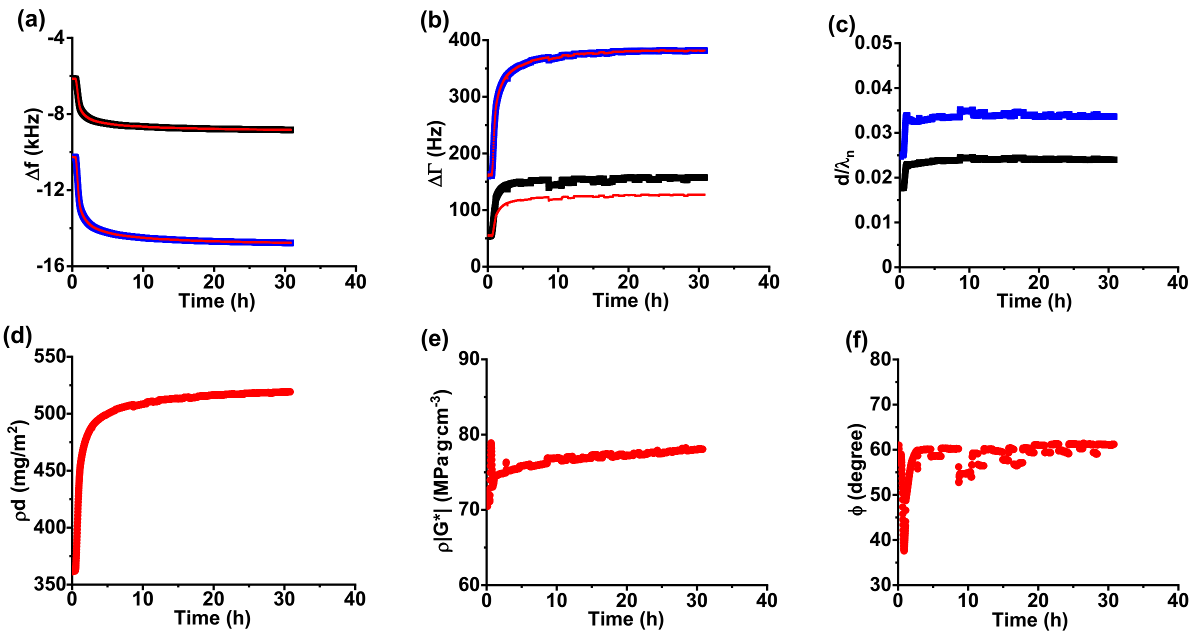

Figure S26. Time dependent QCM-D response for 290.0 nm DeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 1334 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

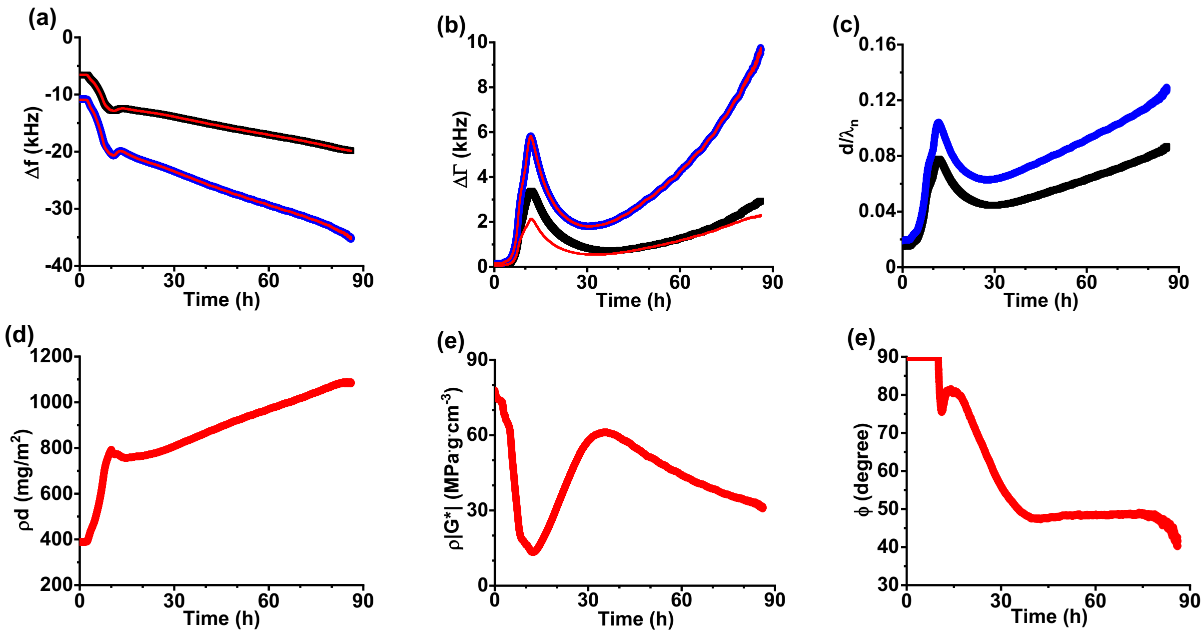

Figure S27. Time dependent QCM-D response for 345.4 nm DeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 3122 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

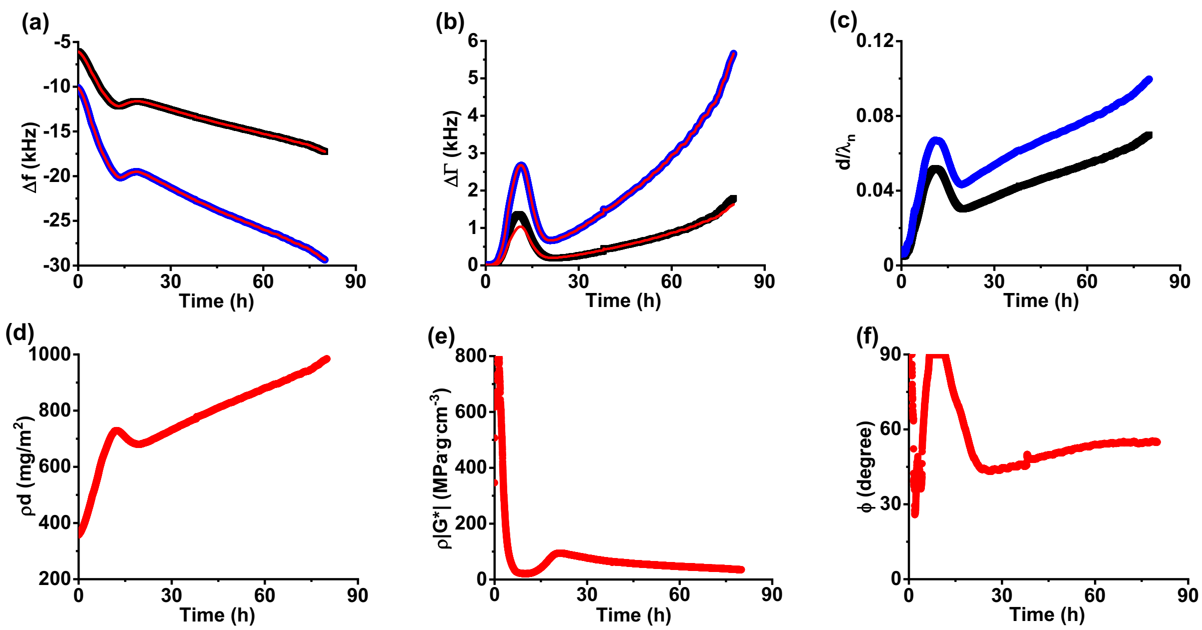

Figure S28. Time dependent QCM-D response for 310.2 nm DeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 3122 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

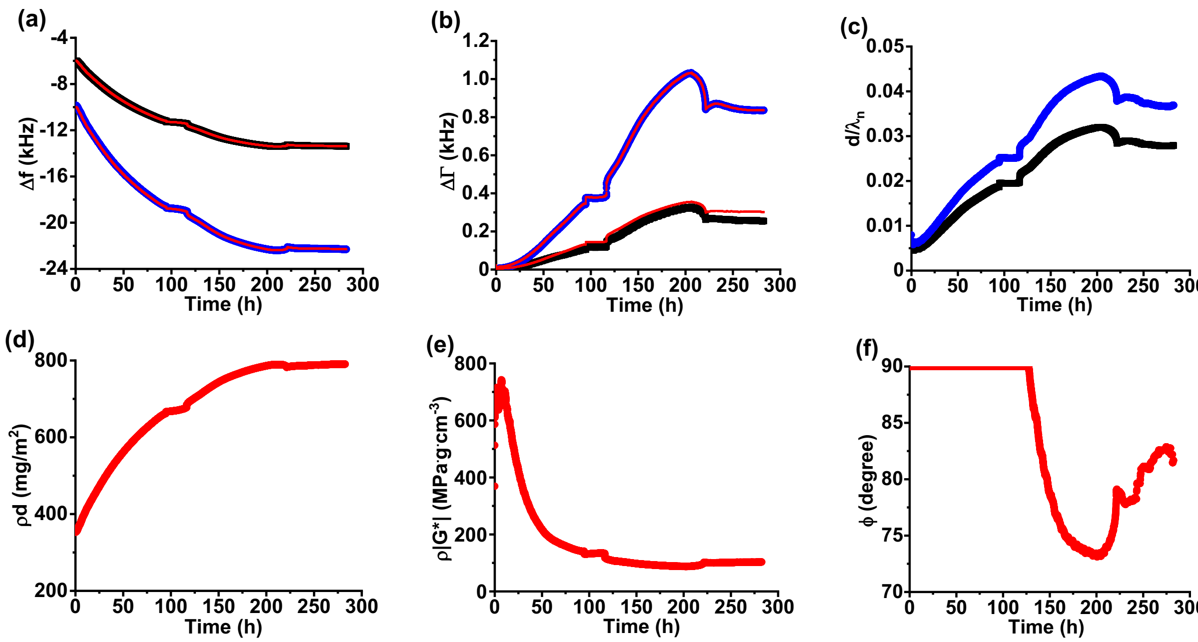

Figure S29. Time dependent QCM-D response for 326.8 nm DeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PPG (M_n = 4093 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

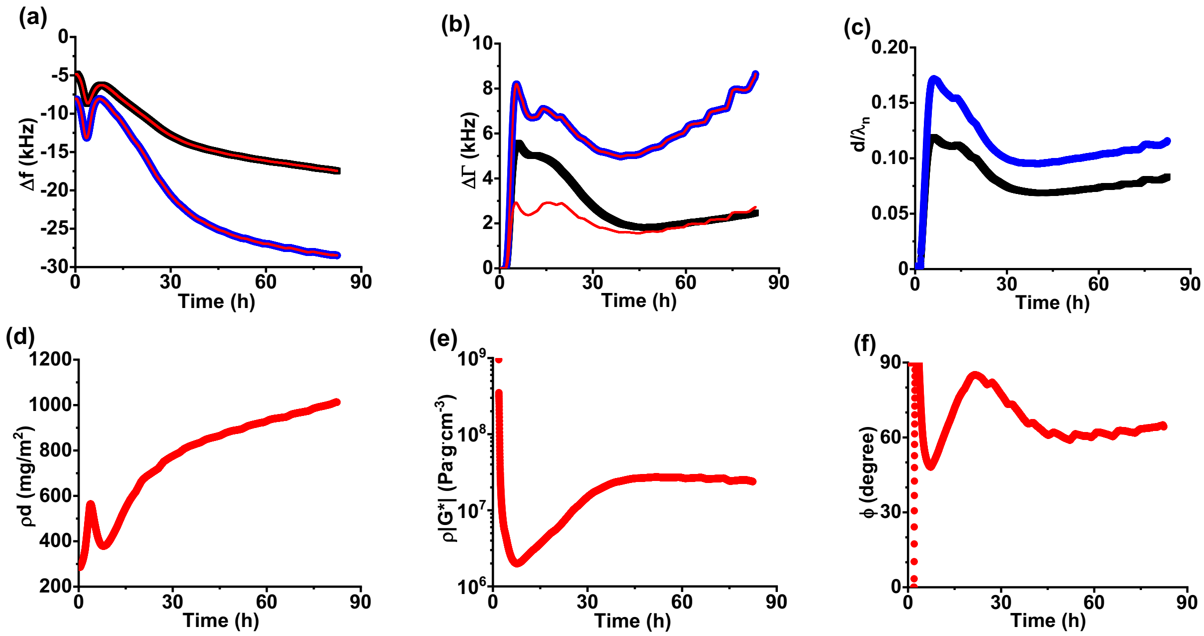

Figure S30. Time dependent QCM-D response for 272.2 nm HeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of Antifoam 204 (M_n = 3238 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

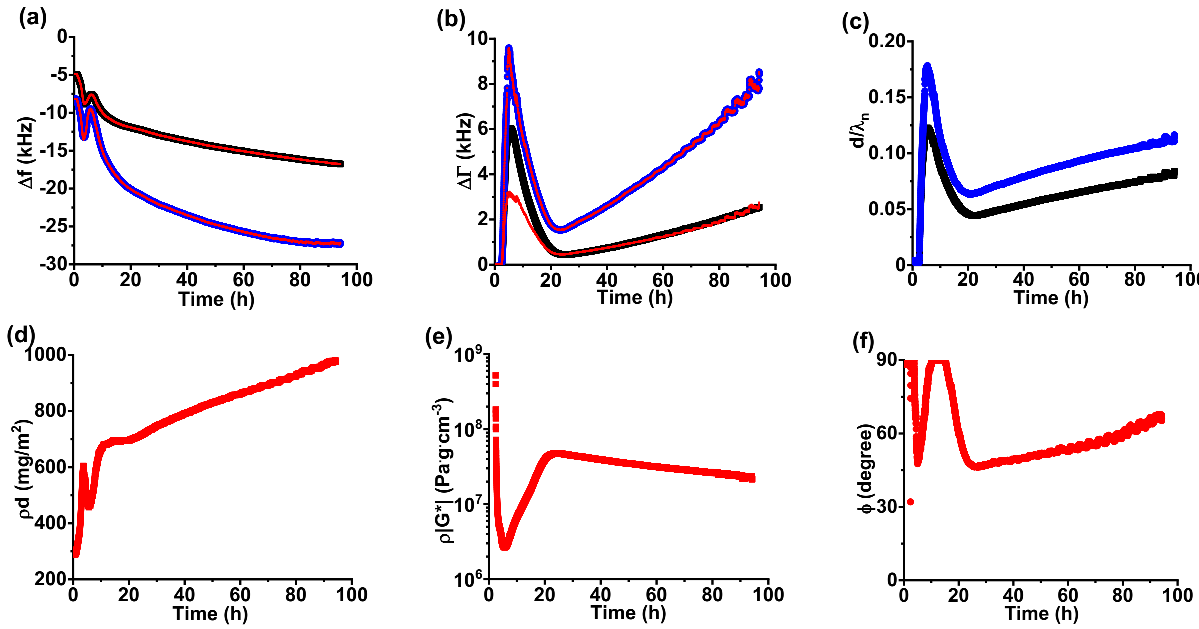

Figure S31. Time dependent QCM-D response for 273.8 nm DeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of Antifoam 204 (M_n = 3238 g/mol) until signals for f_5 and Γ_5 were lost due to excessive dissipation. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

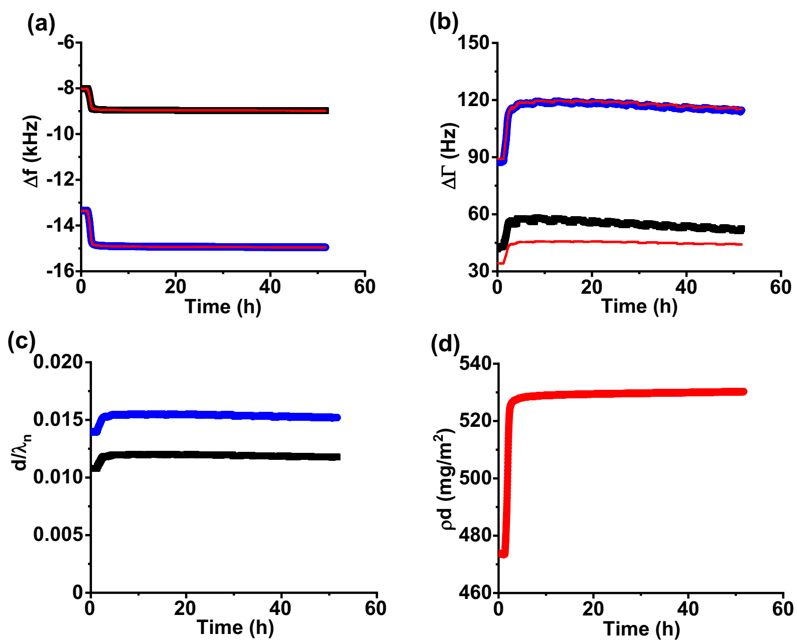

Figure S32. Time dependent QCM-D response for 441.2 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PEG (M_n = 3479 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

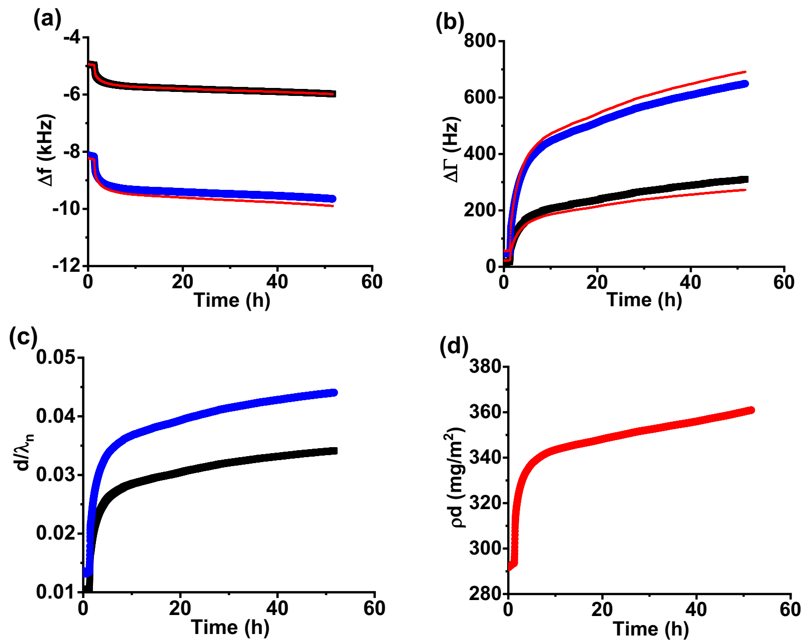

Figure S33. Time dependent QCM-D response for 264.3 nm BuNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PEG (M_n = 3479 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

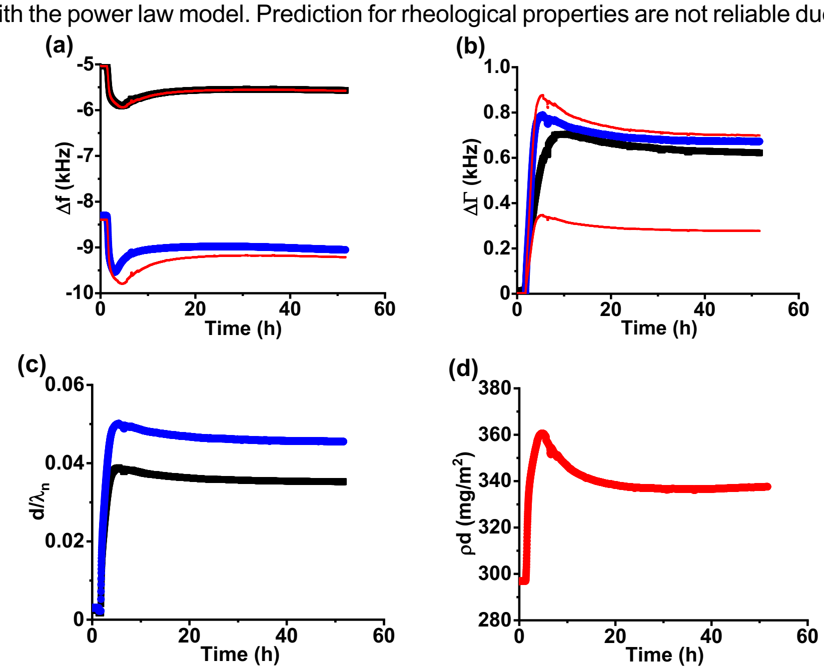

Figure S34. Time dependent QCM-D response for 279.4 nm HeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PEG (M_n = 3479 g/mol) until change in both Δf_3 and Δf_5 was < 6Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

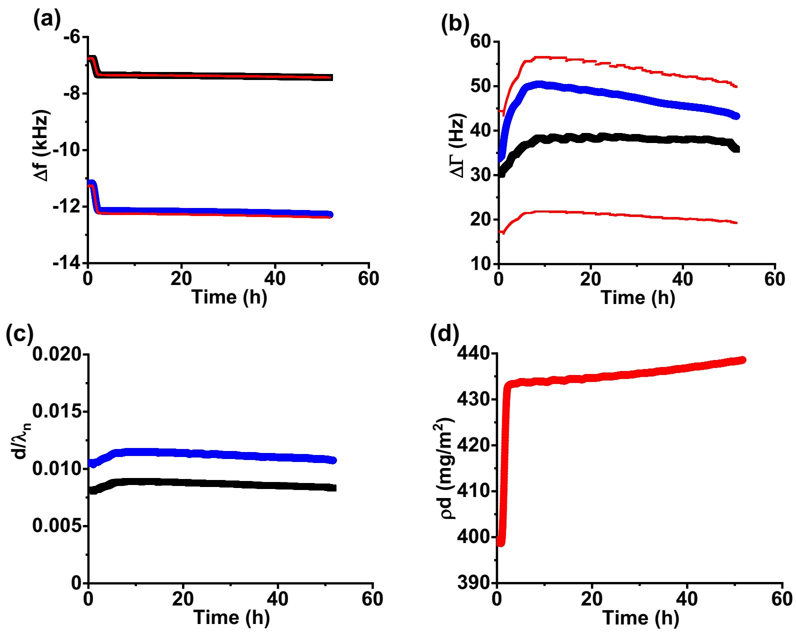

Figure S35. Time dependence for 373.4 nm DeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PEG (M_n = 3479 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

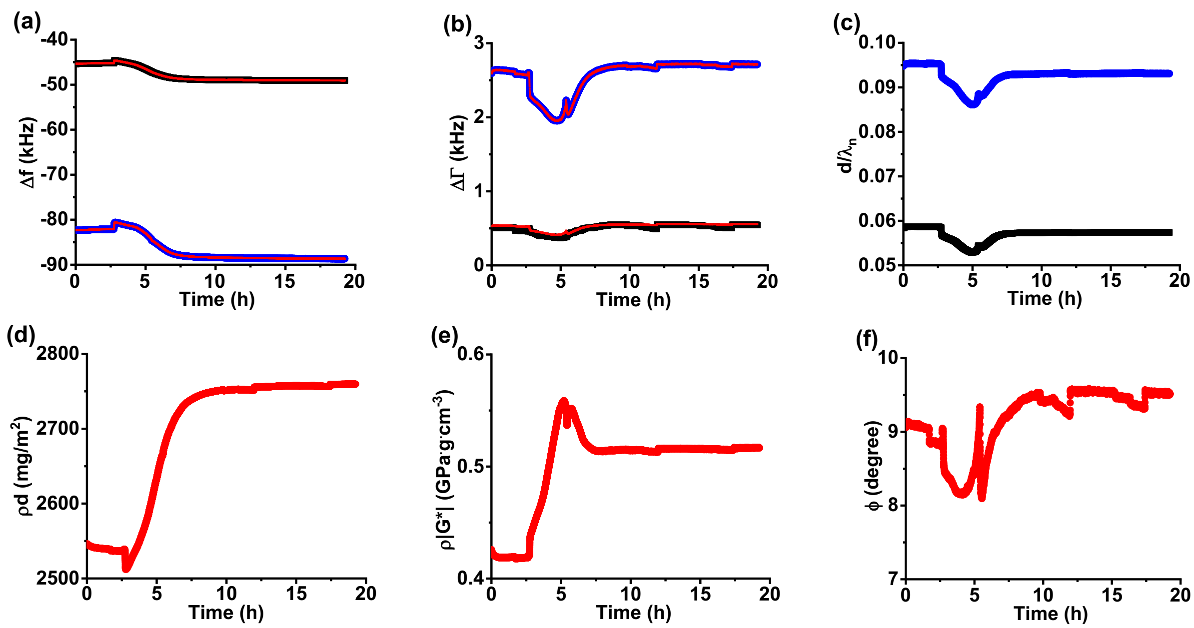

Figure S36. Time dependent QCM-D response for 2394 nm HeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PEG (M_n = 3479 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

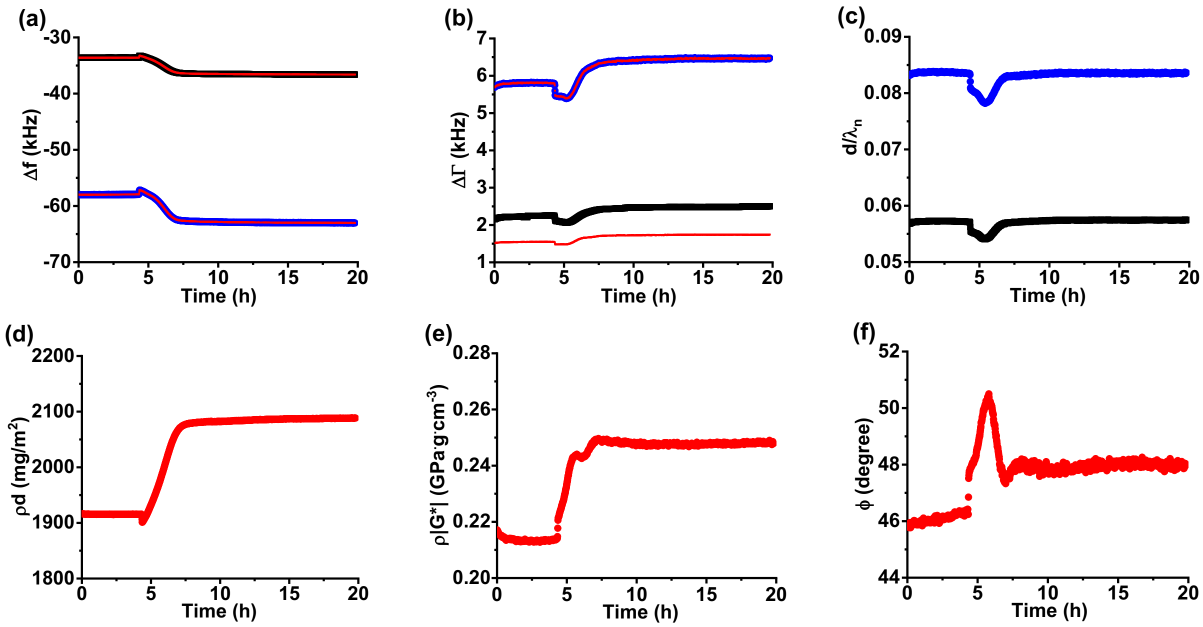

Figure S37. Time dependent QCM-D response for 1724 nm DeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of PEG (M_n = 3479 g/mol) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. From the fits of the frequency and dissipation with the power law model, the (d) areal mass, (e) complex shear modulus, and (f) phase angle were determined.

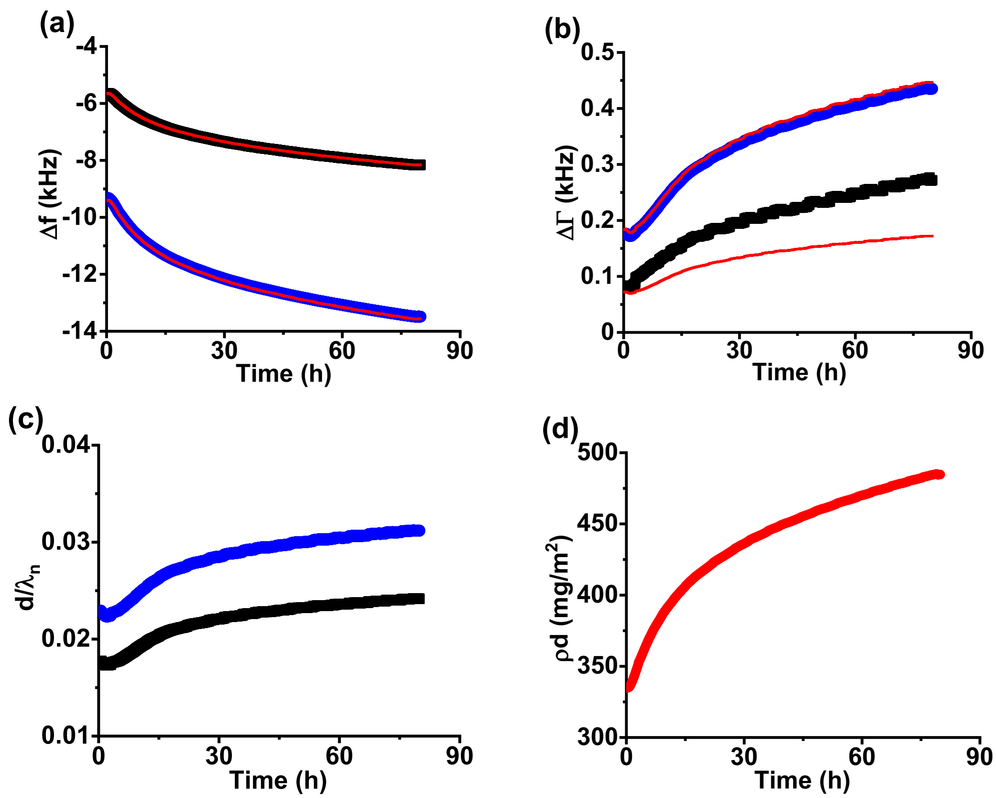

Figure S38. Time dependent QCM-D response for 299.4 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of Pluronic L121 ($M_n \approx 4400$ g/mol, 90 wt% PPG) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

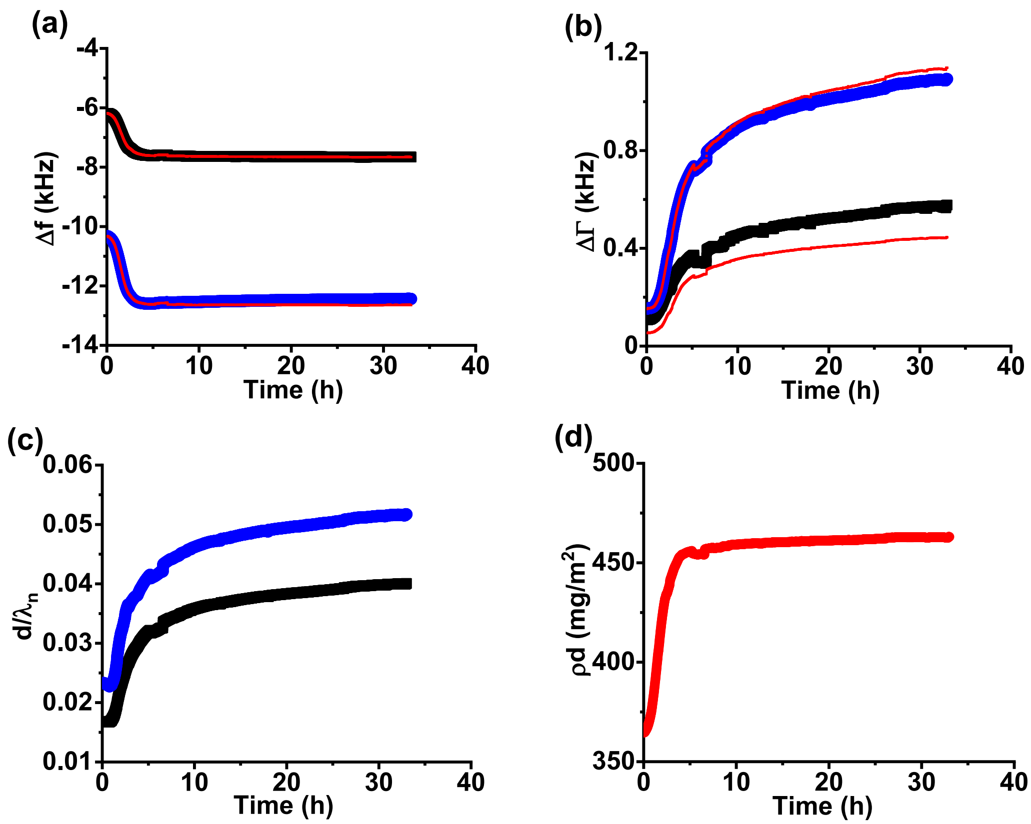

Figure S39. Time dependent QCM-D response for 328.8 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10 ppm of Pluronic F108 ($M_n \approx 14600$ g/mol, 20 wt% PPG) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.

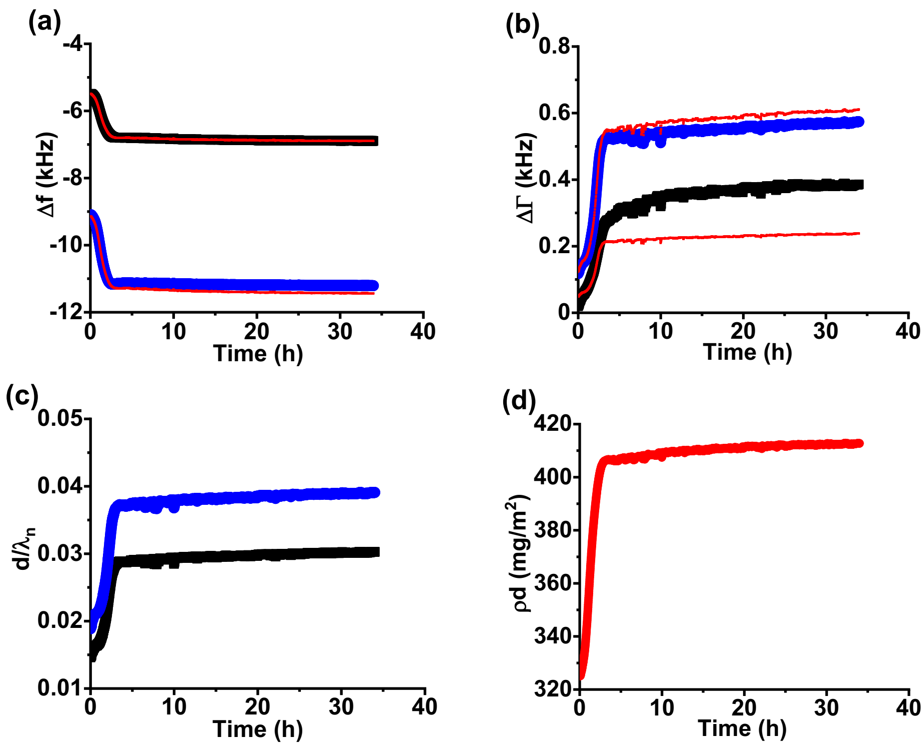

Figure S40. Time dependent QCM-D response for 296.7 nm MeNB-r-HFANB membrane swelling in 1 wt% n-butanol solutions with 10ppm of Pluronic F127 ($M_n \approx$12600 g/mol, 30 wt% PPG) until change in both Δf_3 and Δf_5 was < 6 Hz/hr. Measured values (■, ●) and predicted values (■, ●) of (a) frequency shifts, (b) dissipation change, (c) ratios of thickness to acoustic shear wavelength, d/λ_n, for 3rd and 5th overtone, respectively. (d) areal mass was determined from the fits of the frequency and dissipation with the power law model. Prediction for rheological properties are not reliable due to the low dissipation.