Supporting Information

Bioinspired adhesive polymer coatings for efficient and versatile corrosion resistance

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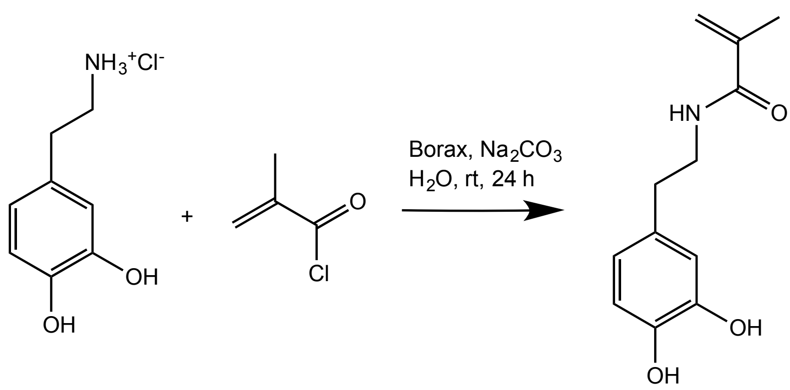
Scheme S1: Synthesis of Dopamine methacrylamide **4** (DOMA).



DOMA **4**

Dopamine methacrylamide **4** was synthesized according to a reported procedure using methacryloyl chloride instead of methacrylic anhydride. It was isolated as a white crystalline powder in 52% yield. ^{1}H NMR (C_2D_6SO, 300 MHz): δ = 8.71 (s, 1 H), 8.60 (s, 1 H), 7.90 (bs, 1 H), 6.63 (d, J = 8.1 Hz, 1 H), 6.57 (d, J = 1.8 Hz, 1 H), 6.42 (dd, J = 7.8 & 1.8 Hz, 1 H), 5.61 (s, 1 H), 5.29 (bs, 1 H), 3.22 (q, 2 H), 2.55 (t, J = 8.1 Hz, 2 H), 1.83 (s, 3 H); ^{13}C NMR (C_2D_6SO, 75 MHz): δ = 167.2, 145.0, 143.4, 140.0, 130.2, 119.1, 118.6, 115.9, 115.4, 40.9, 34.5, 18.5.

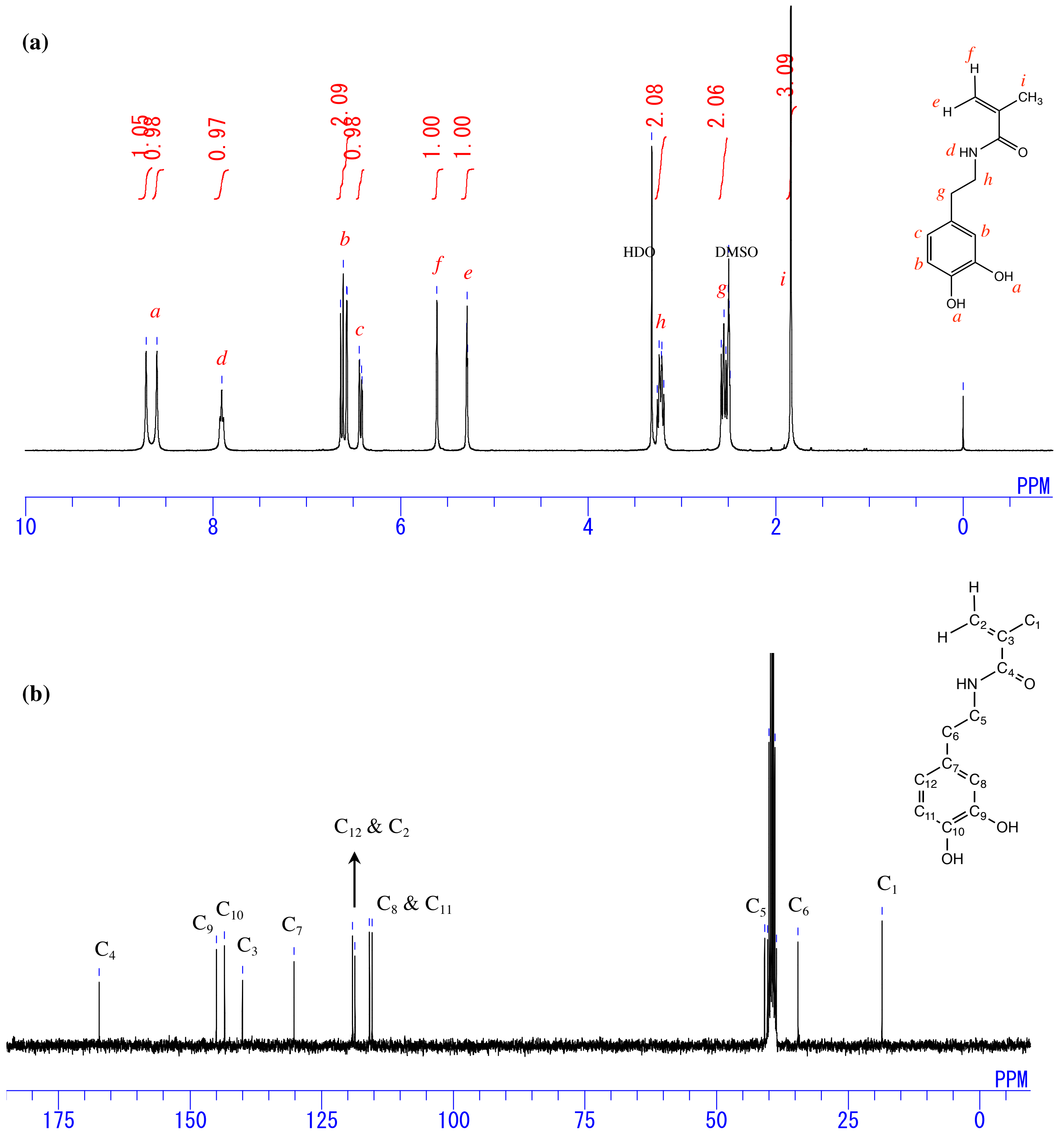
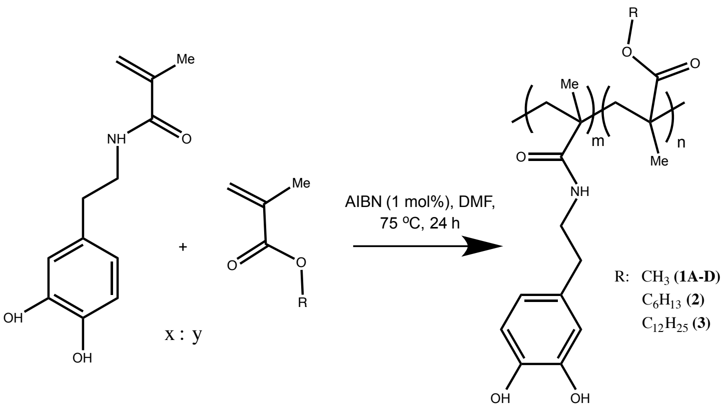


Figure S1: (a) ^{1}H NMR of DOMA and (b) ^{13}C NMR of DOMA in DMSO at 298 K.

Scheme S2: Free radical polymerization of DOMA with various alkyl methacrylates.



Polymer	x : y (feed ratio)[a]	m : n [b]	Yield (%)
Poly **1A**	1 : 5	1 : 7	71
Poly **1B**	1 : 10	1 : 14	84
Poly **1C**	1 : 30	1 : 33	89
Poly **1D**	1 : 90	1 : 100	81
Poly **2**	1 : 2	1 : 6	61
Poly **3**	1 : 3	1 : 12	62

[a]Initial molar ratio, [b]calculated from ^{1}H NMR

^{1}H-NMR characterization:

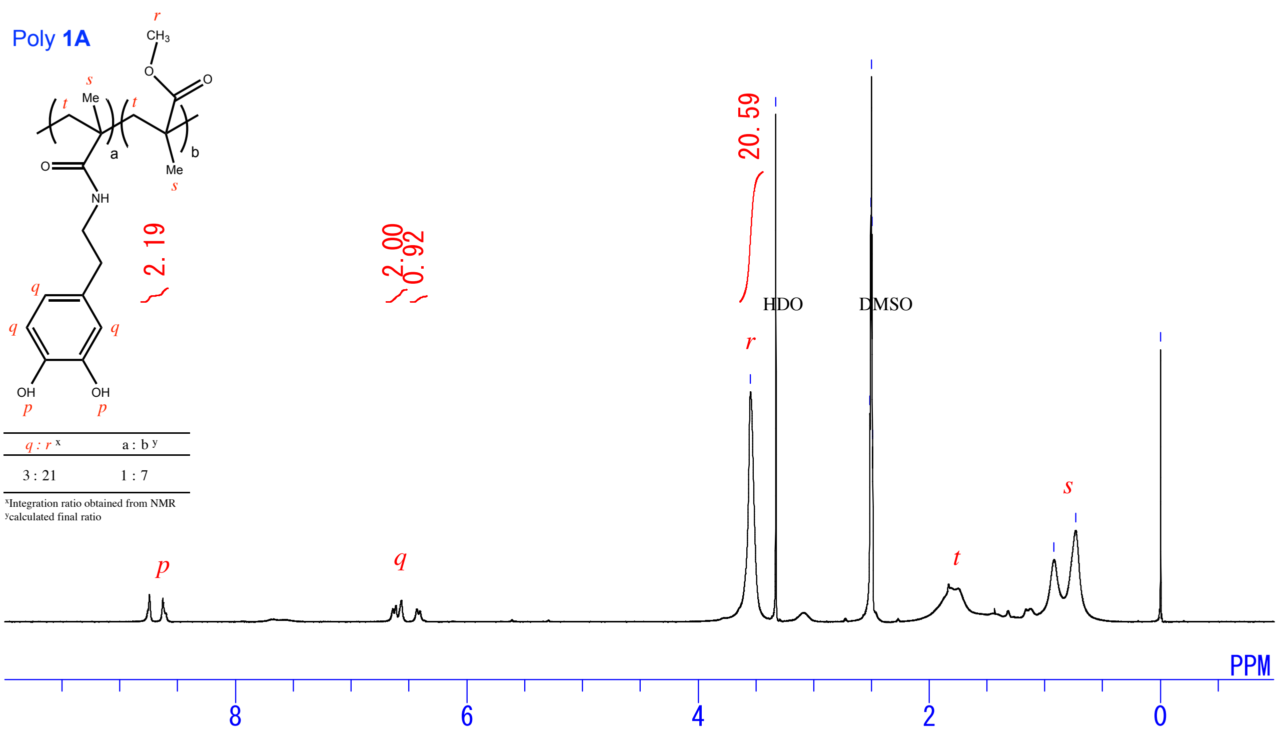


Figure S2: ^{1}H NMR of poly **1A** in DMSO at 298 K.

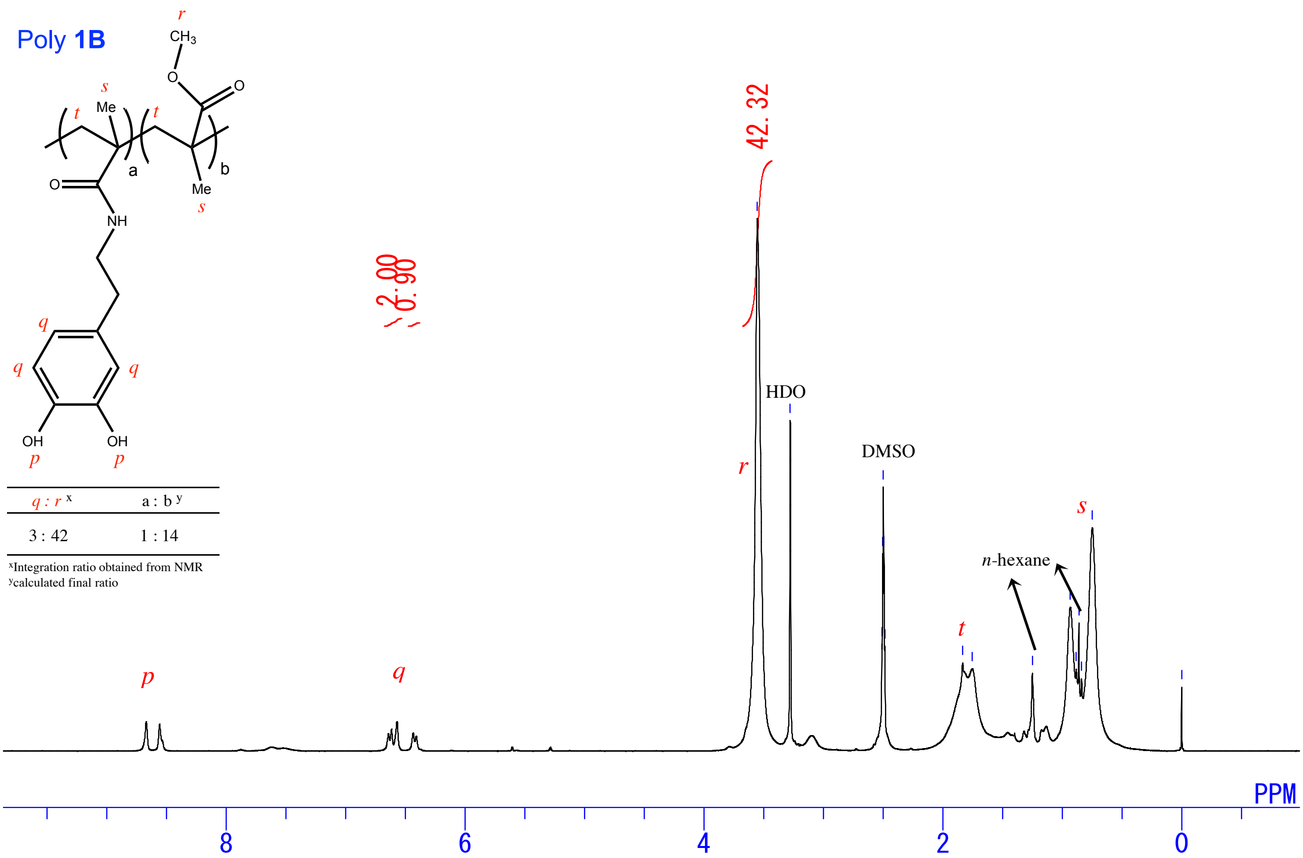


Figure S3: ^{1}H NMR of poly **1B** in DMSO at 298 K.

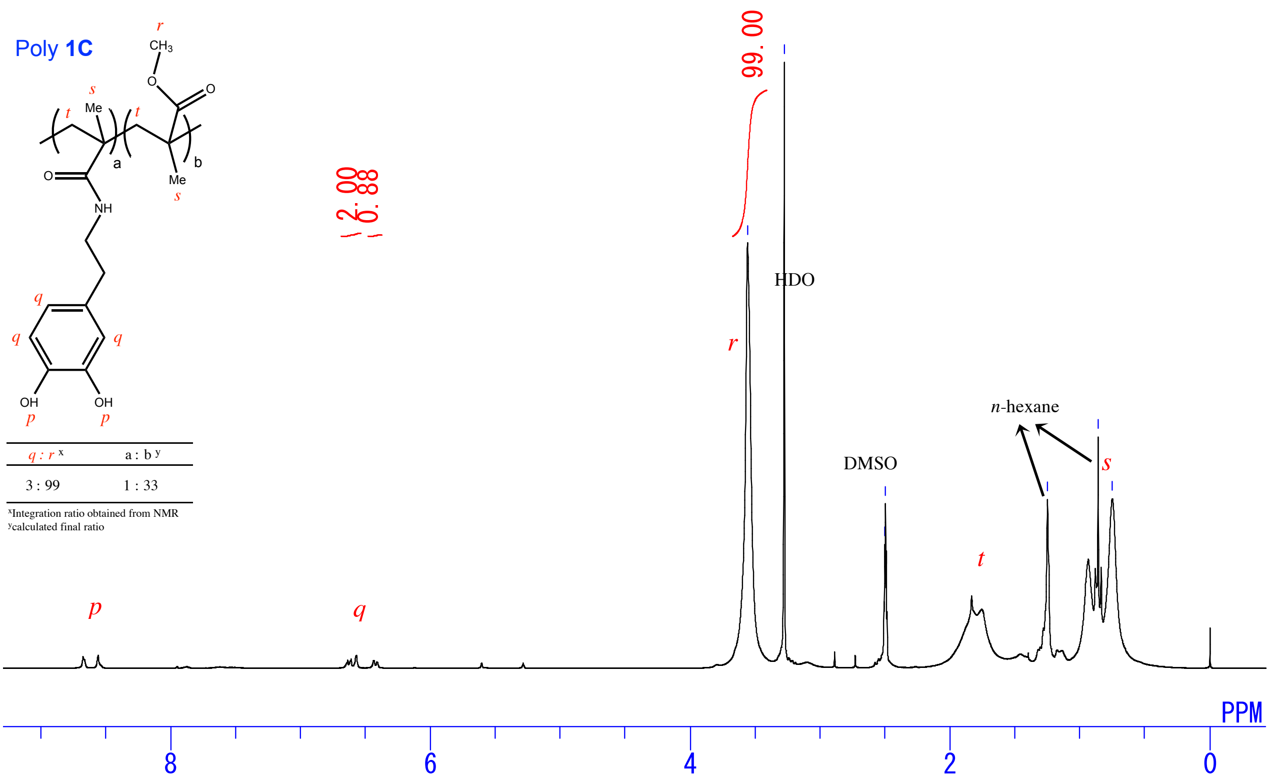


Figure S4: ^{1}H NMR of poly **1C** in DMSO at 298 K.

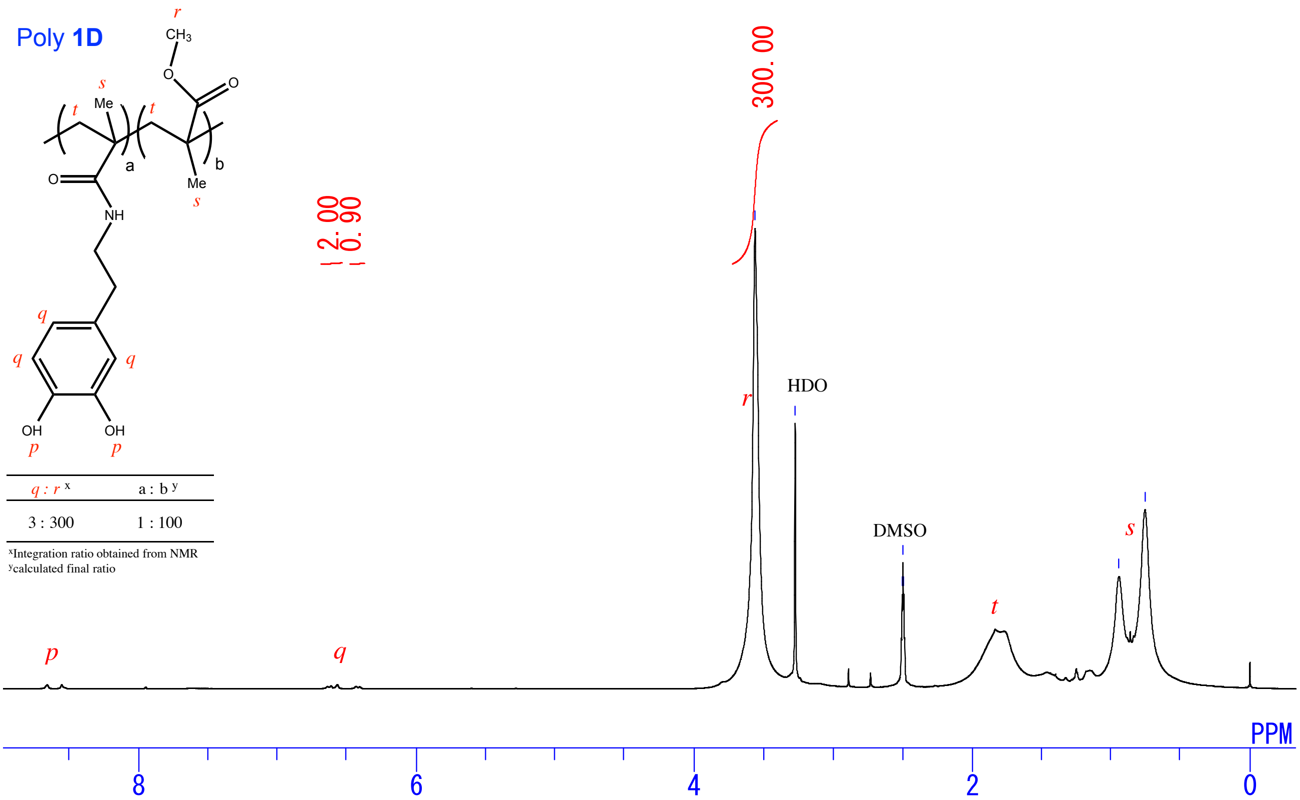


Figure S5: ^{1}H NMR of poly **1D** in DMSO at 298 K.

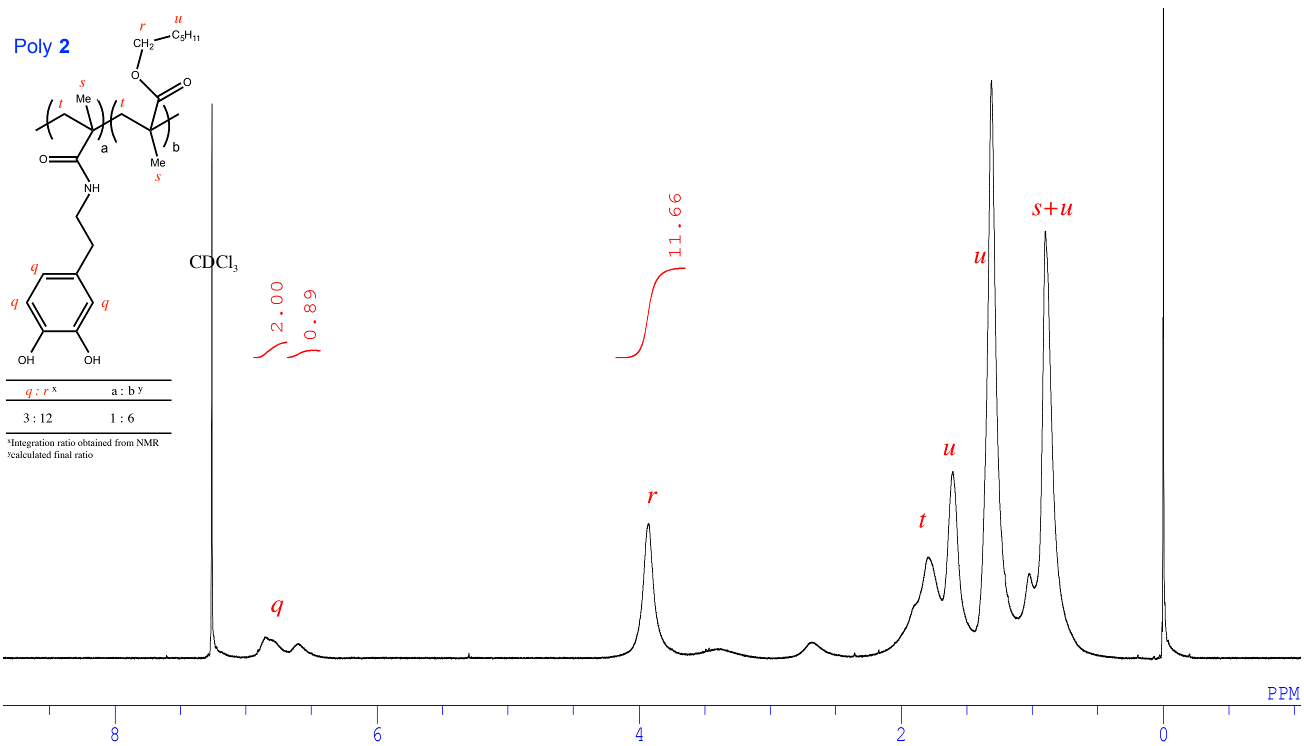


Figure S6: ^{1}H NMR of poly **2** in $CDCl_3$ at 298 K.

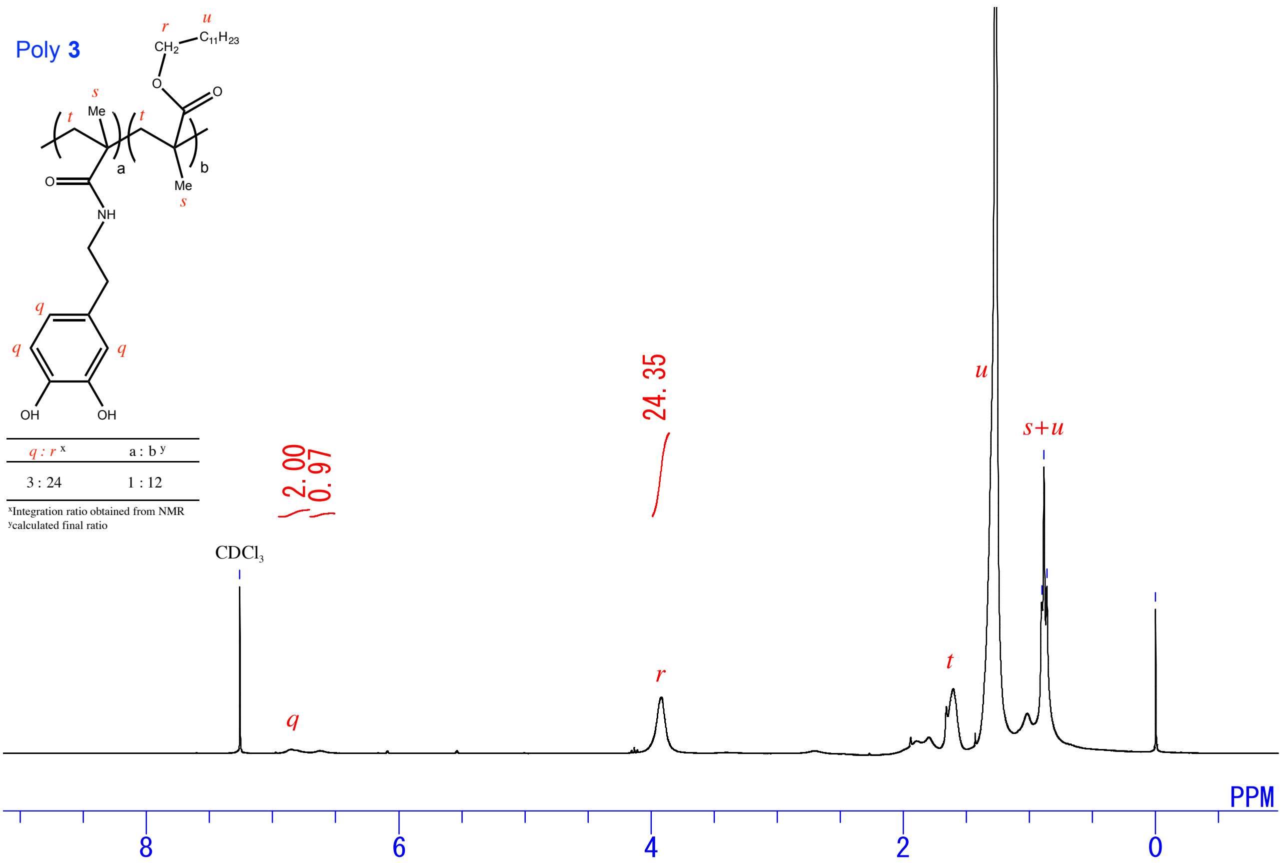


Figure S7: ^{1}H NMR of poly **3** in $CDCl_3$ at 298 K.

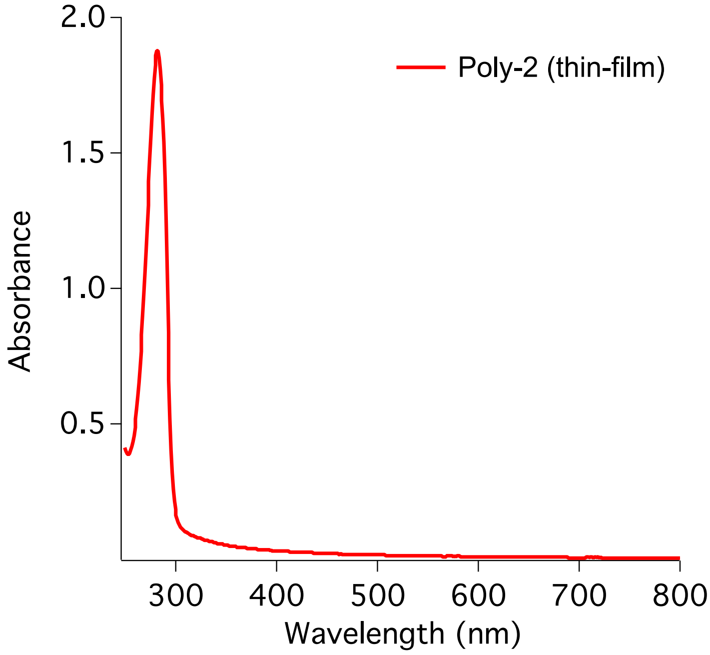


Figure S8: UV-Vis spectrum of poly **2** thin-film on quartz substrate. Absence of any peak between 400-700 nm indicates complete transparency of the coating.

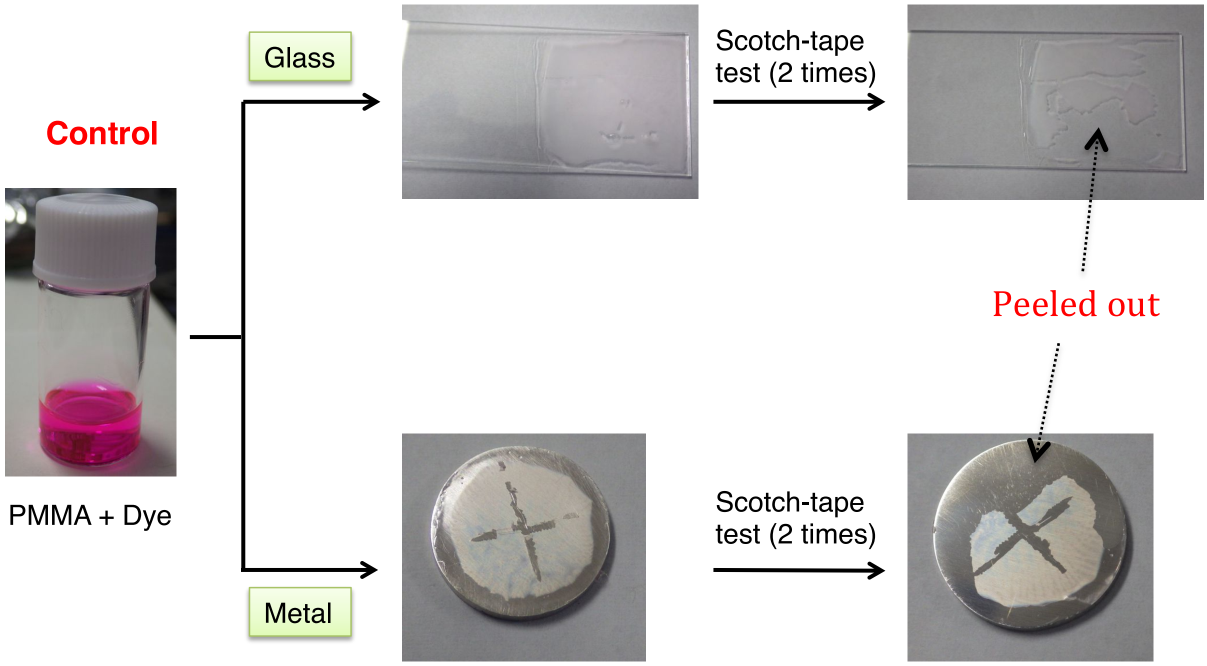


Figure S9: Photographs of scotch-tape test of PMMA coated (control) glass/Mg substrate.

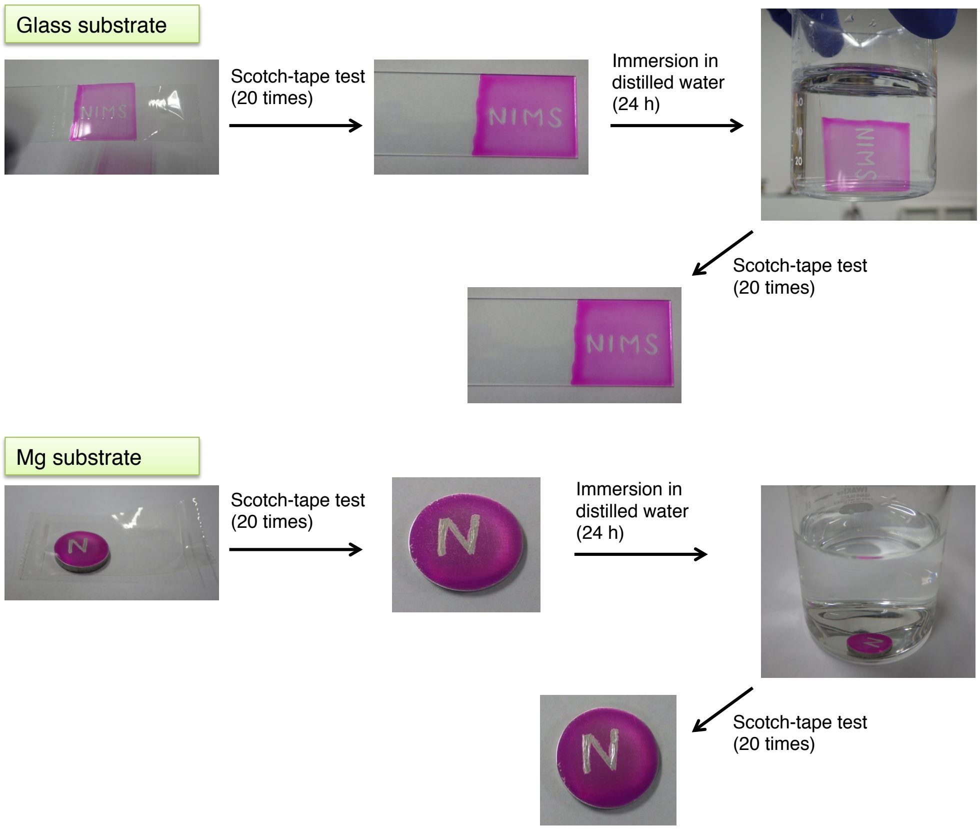


Figure S10: Details procedure of scotch-tape test for poly **2** coated glass/Mg substrate. Pink color is due to addition of small amount of Rhodamine B dye as color indicator to understand the presence of polymer coating.

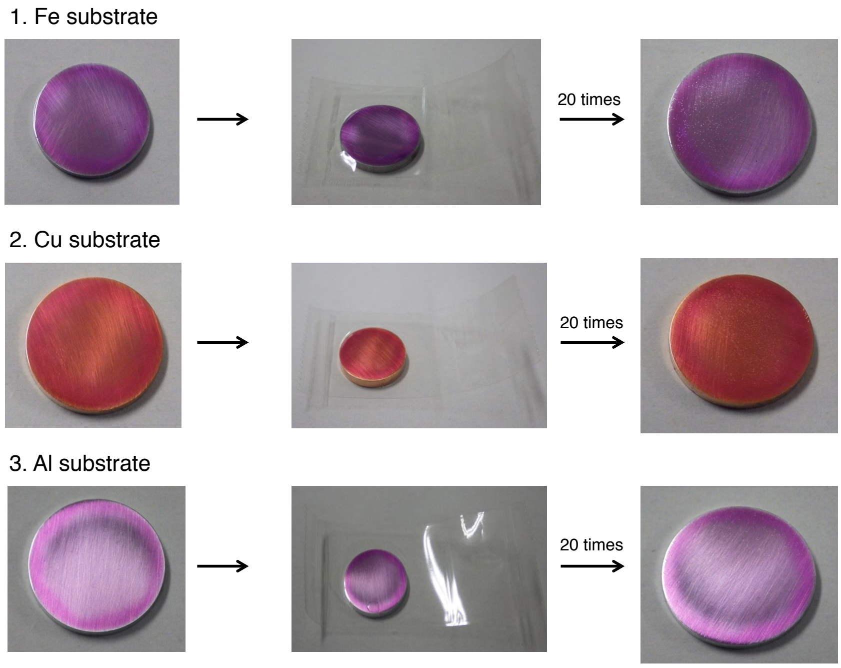


Figure S11: Demonstration of perfect adhesiveness of poly **2** for versatile metal/alloy substrates of Fe, Cu, and Al by scotch-tape test.

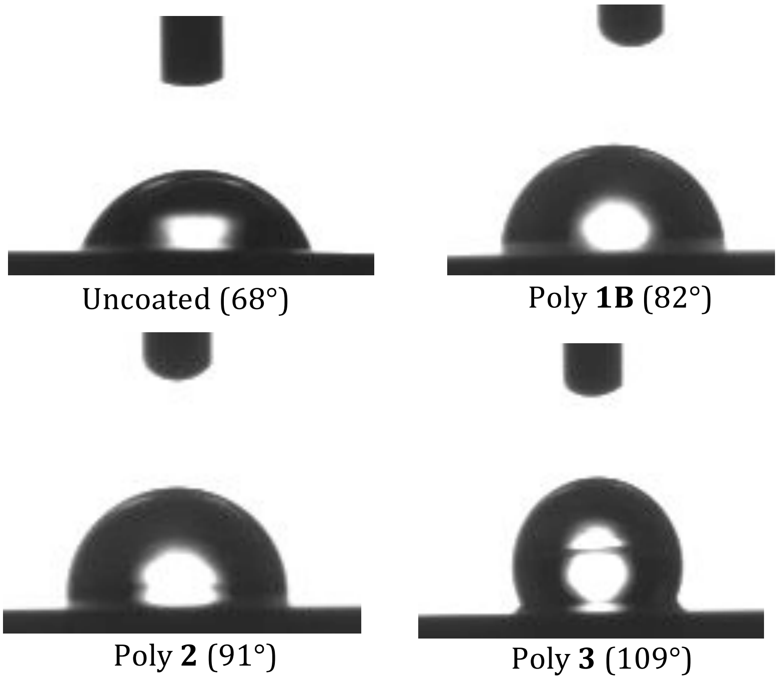


Figure S12: Image of static water contact angle of different polymer coated metal substrates at 298 K. A 2 mg water droplet was carefully syringed out and reported contact angle is an average of 6-7 measurements over entire area for each sample.

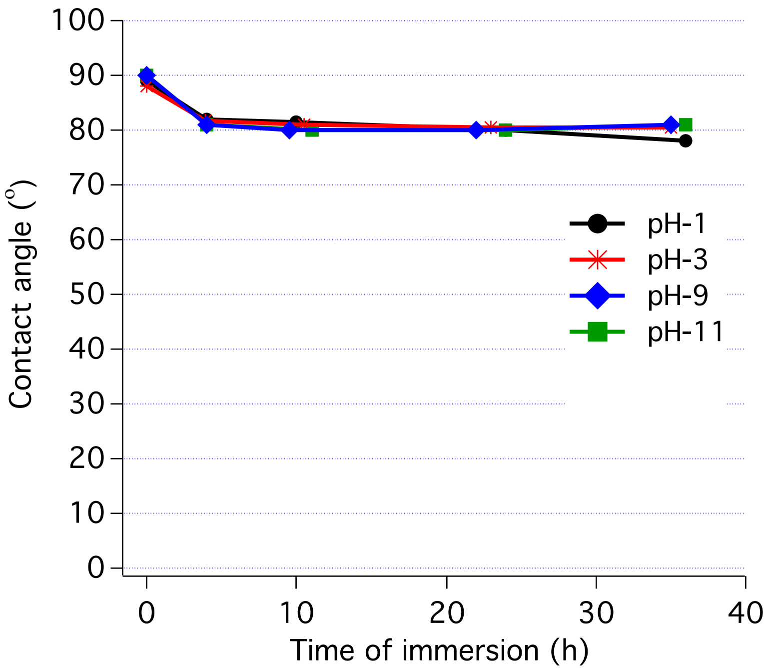


Figure S13: Time-dependent static water contact angle of poly **2** thin-film on glass substrates at different pH. pH-1 and 3 (adjusted with 1M HCl), pH-9 (Tris buffer), and pH-11 (adjusted with 1M NaOH) were used in this study. After immersion for specified time, samples were thoroughly washed with distilled water and dried by nitrogen flow.

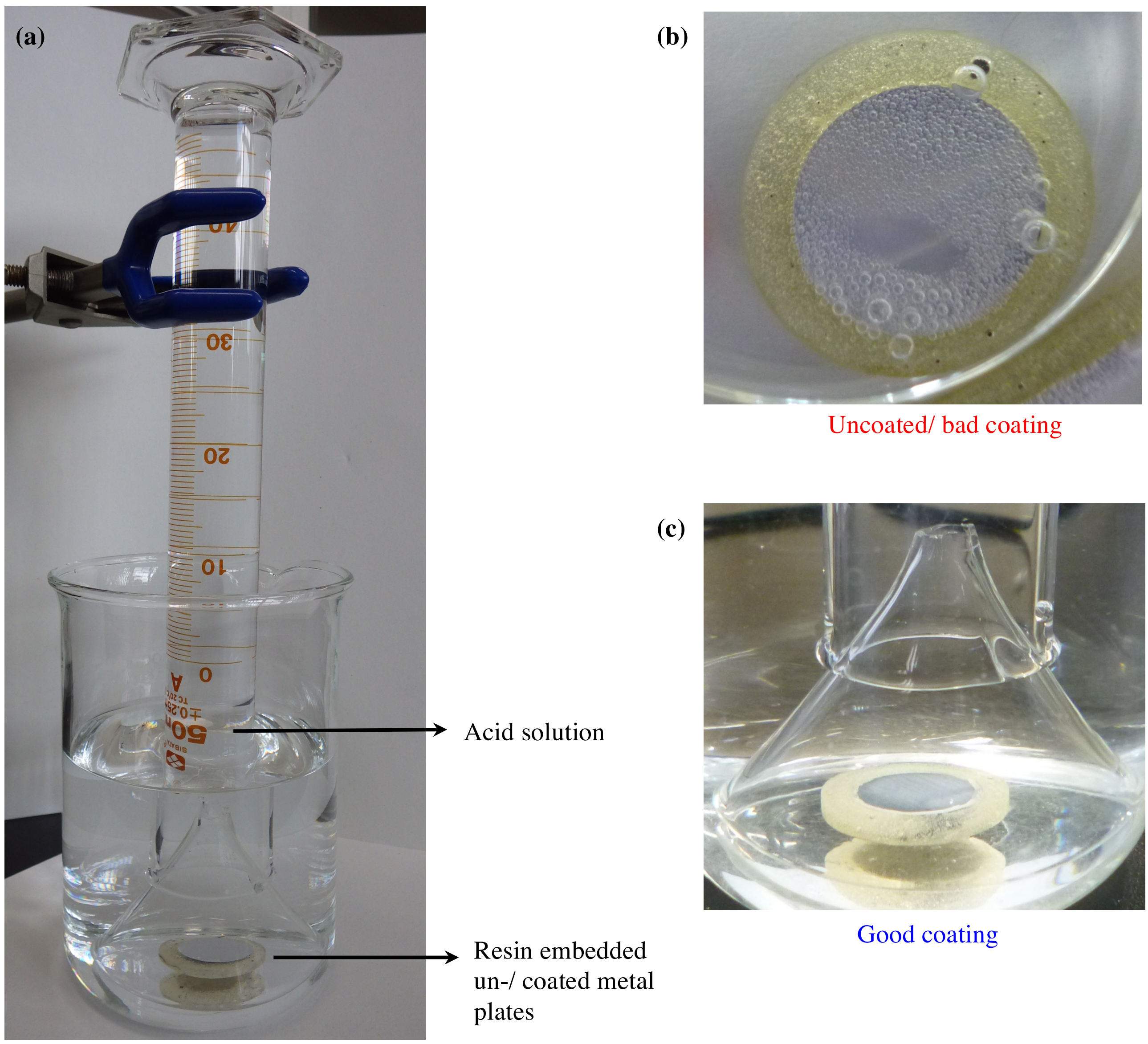


Figure S14: (a) A simple setup for immersion test under acidic condition. Amount of hydrogen evoluted was calculated from decrease of solution level in the measuring cylinder. A representative example of (b) uncoated/ bad coating and (c) good coating samples.

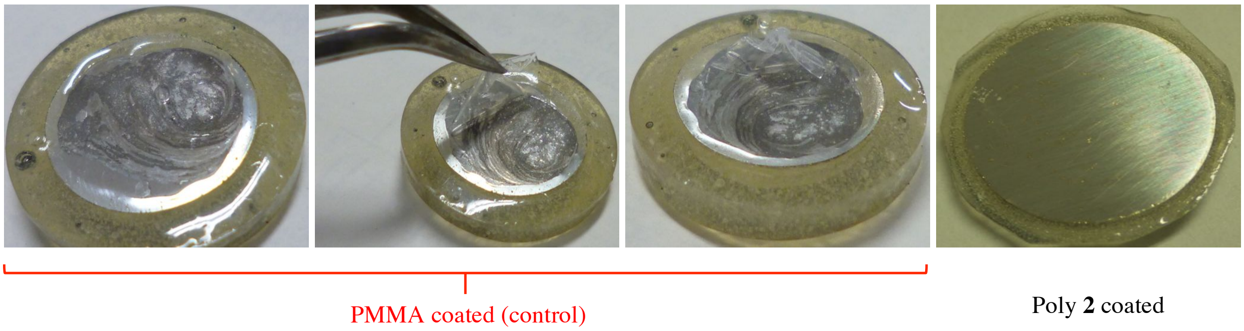


Figure S15: Digital images of PMMA coated (control) sample showing swelled polymer film, and poly **2** coated Mg alloy AZ31 after immersion in 3.5 wt.% NaCl solution for 96 and 120 h, respectively at 298 K. Mg plates were 15 mm in diameter and resin embedded except top side.

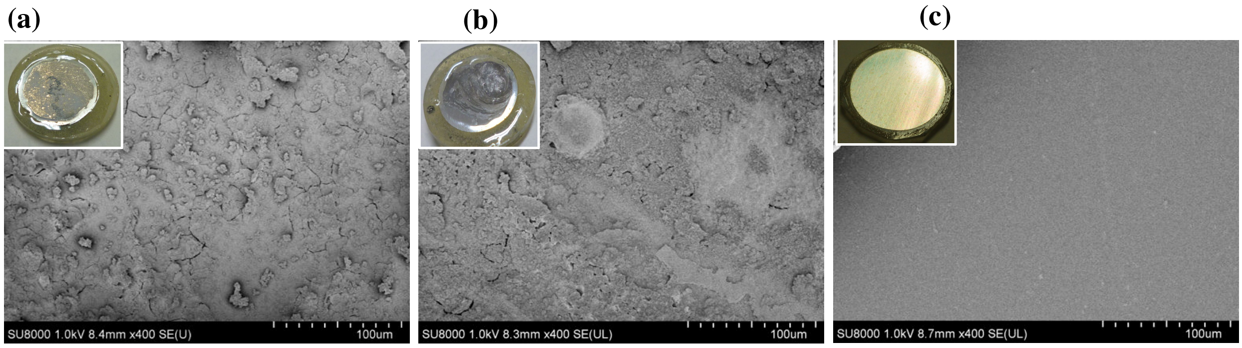


Figure S16: SEM images of (a) uncoated, (b) PMMA coated {control}, and (c) poly **2** coated Mg alloy AZ31 after immersion in 3.5 wt.% NaCl solution for 18, 96 and 120 h, respectively at 298 K. Mg plates were 15 mm in diameter and resin embedded except top side. Inset figures are digital image of the samples.

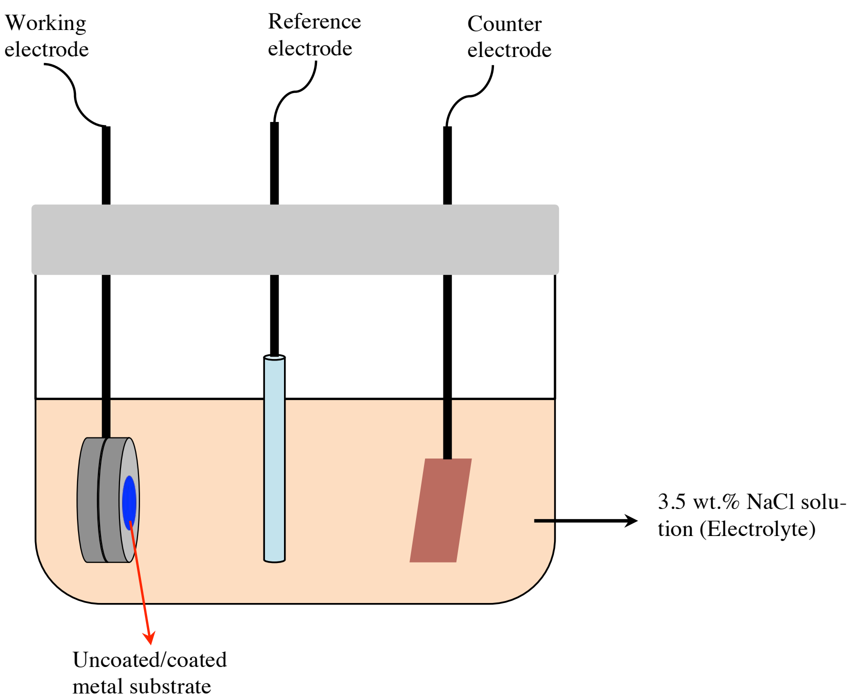


Figure S17: Schematic diagram of polarization test set-up showing different electrodes and electrolyte. Metal plate of 15 mm diameter used in this study.

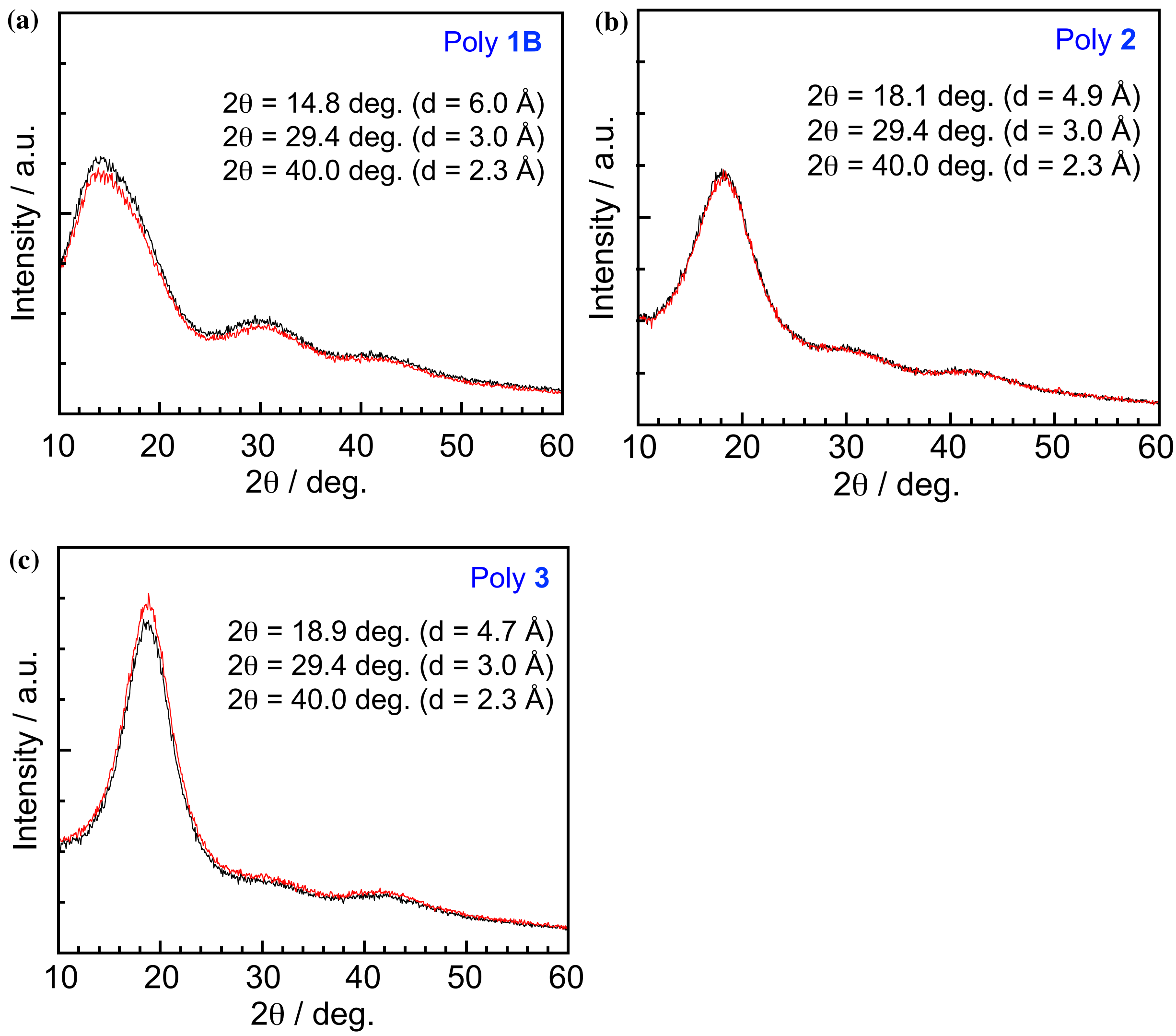


Figure S18: GI-WAXD measurement data of (a) poly **1B**, (b) poly **2**, and (c) poly **3**. Black and red lines are as-spun and annealed samples, respectively.