Supporting Information

Performance of environmentally friendly, liquid-infused coatings against biofouling: evaluation of macrofouling and microbial-induced corrosion in freshwater environments

Teresa Walter[1], Manuela Langbein[2], Patrik Blenk[2], Alexander Tesler[3], Lucia Prado[3], Dan Bornstein[3], Sannakaisa Virtanen[3], Kathrin Castiglione[2,*], and Nicolas Vogel[1,*]

[1]Institute of Particle Technology, Friedrich-Alexander-Universität Erlangen-Nürnberg, 91058 Erlangen, Germany

[2]Institute of Bioprocess Engineering, Friedrich-Alexander-Universität Erlangen-Nürnberg, 91052 Erlangen, Germany

[3]Chair of Surface Science and Corrosion, Friedrich-Alexander-Universität Erlangen-Nürnberg, 91058 Erlangen, Germany

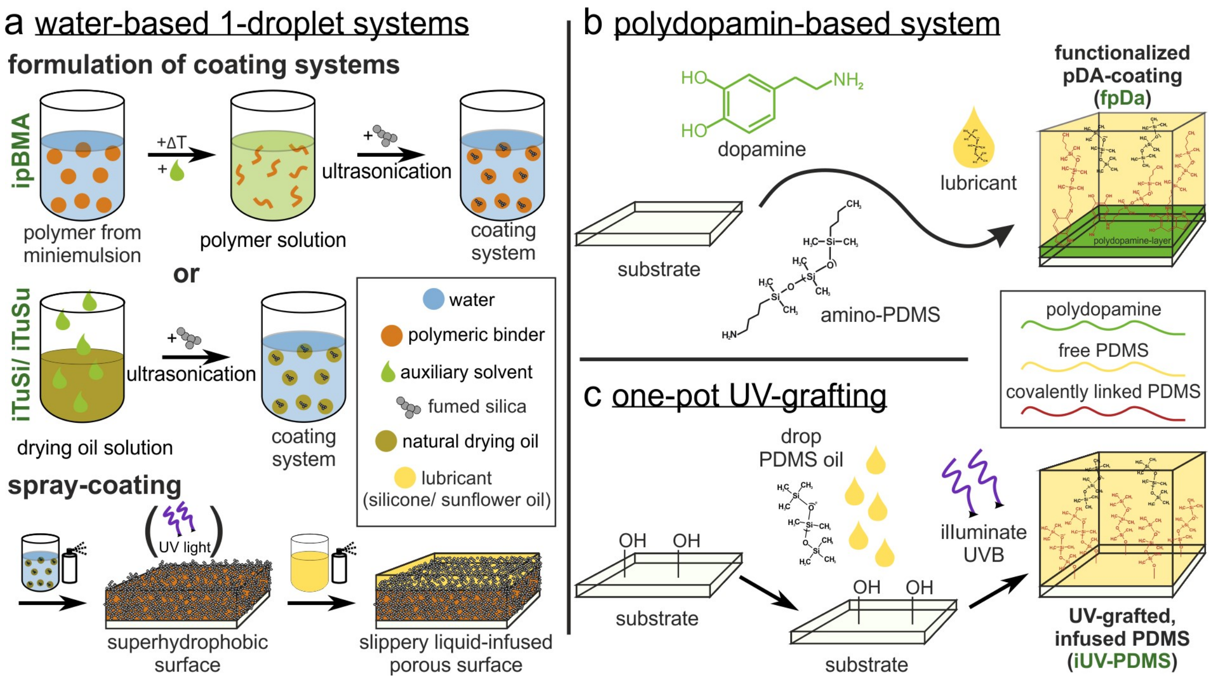

Figure SI 1: Detailed description of the fabrication processes for the different environmentally friendly, slippery coatings used in this study. a) Water-based 1-droplet systems to prepare the SLIPSs ipBMA, iTuSi and iTuSu using methods by Walter et al.[1] and Dehm et al.[2], respectively. b) Polydopamine based system to prepare fpDa (polydopamine-anchored and infused polydimethylsiloxane chains) using a method by Chiera et al.[3]. c) One-pot UV-grafting to prepare iUV-PDMS (UV-grafted and infused polydimethylsiloxane chains) using a method by Tesler et al.[4]

Table SI 1: Reference values of the coatings used in this study to provide a quality control for all coatings used in this study. The established and published coating procedures in our lab were used, and reference values for all parameters (Contact angle, contact angle hysteresis, and sliding angles) were determined.

Coating system	Contact angle w/o infiltration	Contact angle w/ infiltration	Contact angle hysteresis	Sliding angle
ipBMA[1]	155 ± 1 °	109 ± 2 °	2 ± 1 °	< 5 °
iTuSi[2]	153 ± 1 °	102 ± 2 °	9 ± 1 °	< 10 °
iTuSu[2]	153 ± 1 °	82 ± 1 °	8 ± 1 °	< 10 °
fpDa[3]	90 ± 3 °	100 ± 3 °	2 ± 1 °	< 5 °
iUV-PDMS[4]	-*	106 ± 1 °	3 ± 1 °	< 5 °

*coating directly forms with lubricant layer

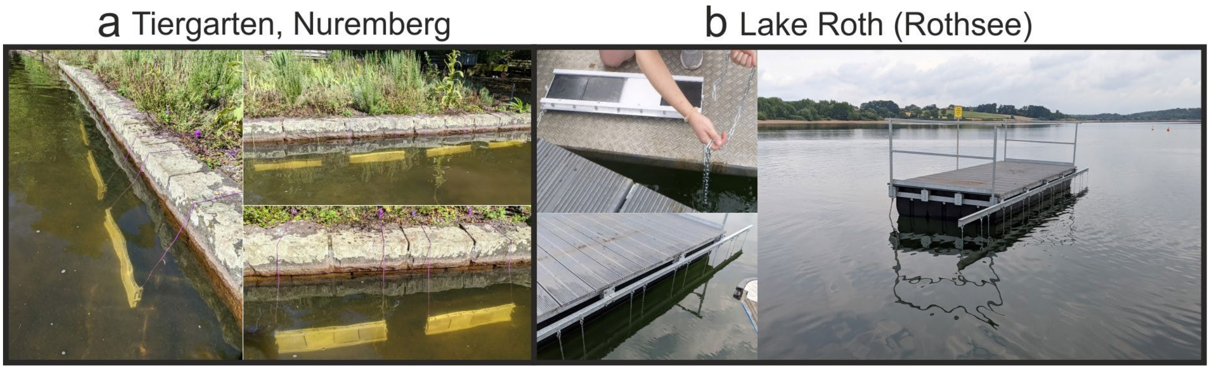

Figure SI 2: Locations and set-up of field studies. A) Field study at Tiergarten Nuremberg, Bavaria, Germany. Triplicates of the different coatings were randomly placed in frames (4 samples each) which were fixed at the bottom of a pond at a depth of ~50 cm. b) Field study at lake Roth (Rothsee), Bavaria, Germany. Triplicates of the different coatings were randomly placed in frames (4 samples each) which were attached onto a swimming platform in the center of the lake at a depth of approximately 3 m.

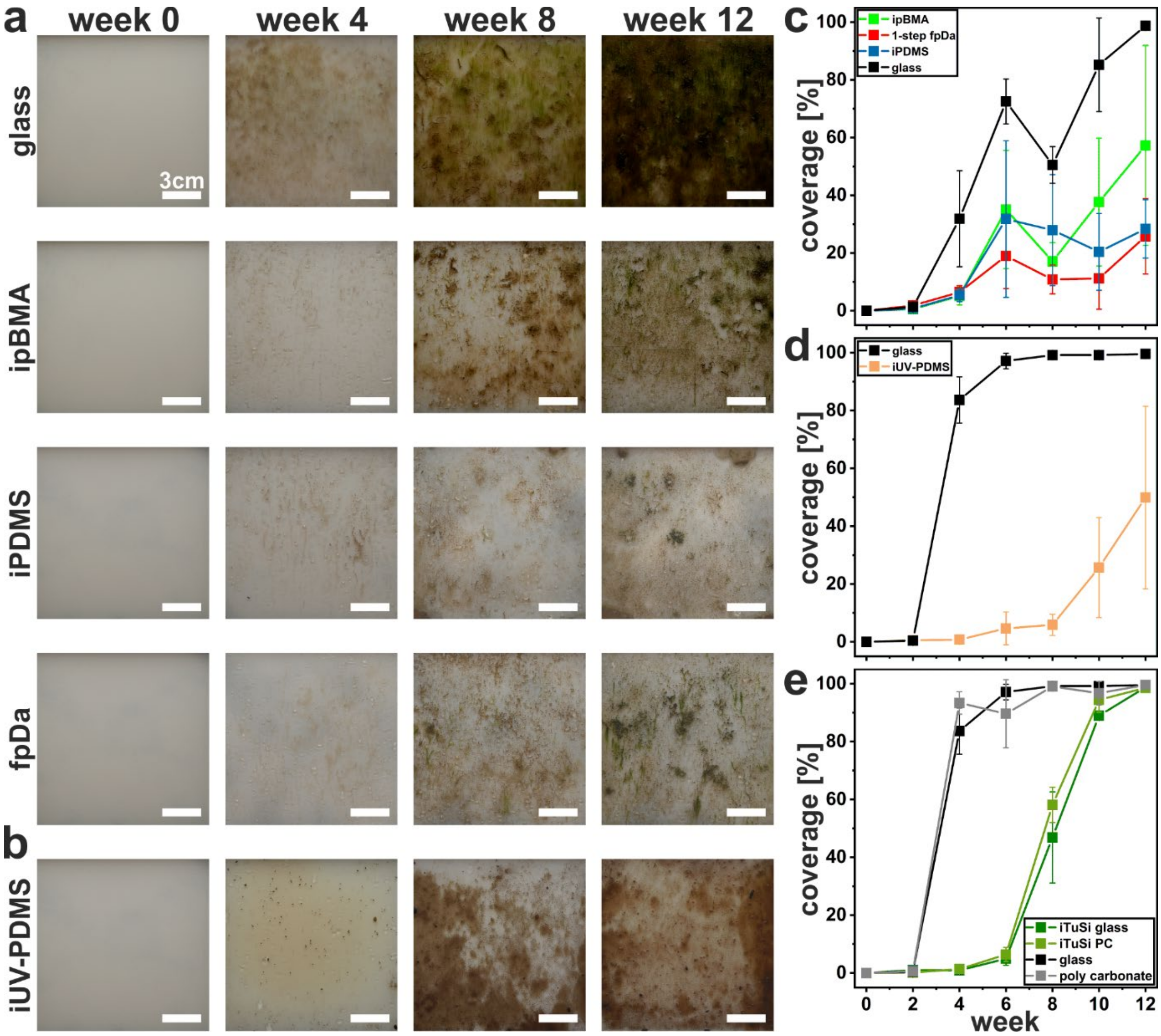

Figure SI 3: General biofouling on coated samples during field studies at Tiergarten Nuremberg, Germany. a) Exemplary images of the fouling development on uncoated and coated glass samples during a study in fall 2021 before and after 4, 8 and 12 weeks. First row: uncoated glass, second row: ipBMA[1], third row: iPDMS[5], fourth row: 1-step fpDa[6]. b) Exemplary images of the fouling development on iUV-PDMS[4] coated glass samples during a study in fall 2022 before and after 4, 8 and 12 weeks. c) Coverage analysis of ipBMA, iPDMS, and 1-step fpDa on glass compared to an uncoated glass reference during a field study in fall 2021. d) Coverage analysis of iUV-PDMS coated on glass compared to an uncoated glass reference during a field study in fall 2022. e) Coverage analysis of iTusi[2] coated on glass and polycarbonate compared to an uncoated glass and polycarbonate reference during a field study in fall 2022.

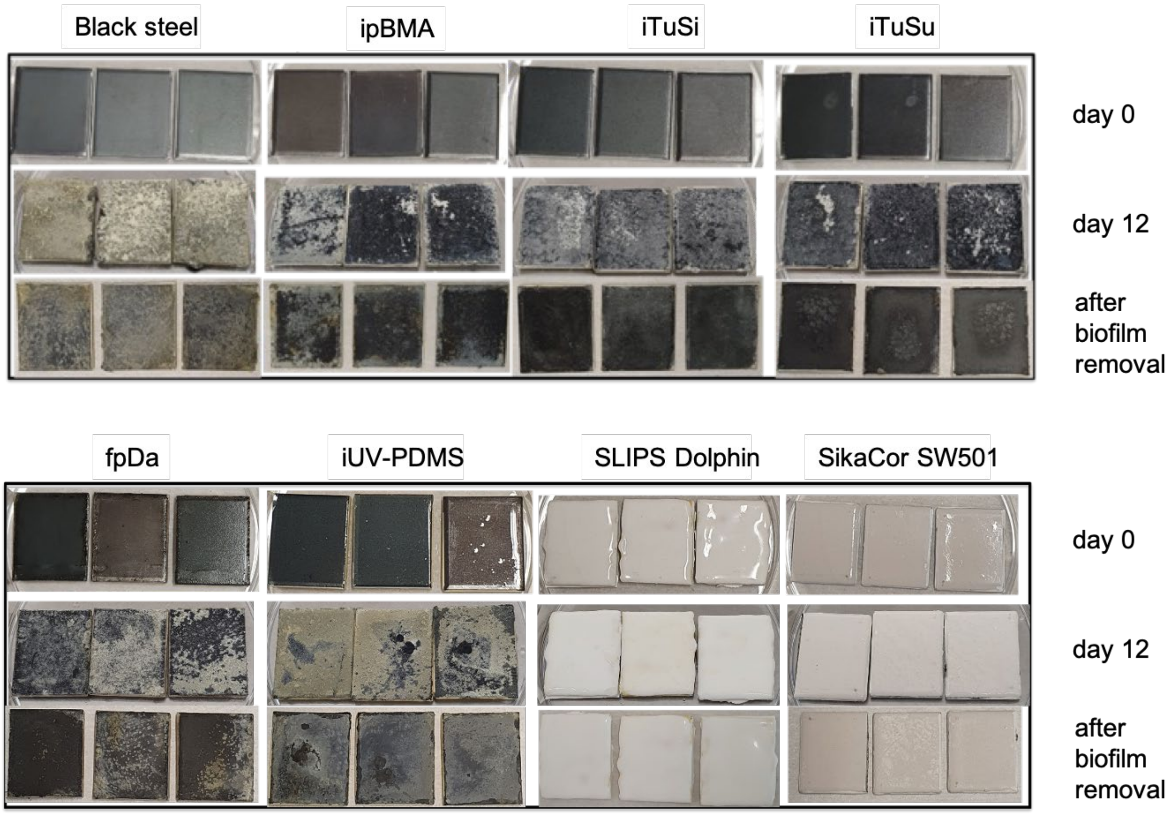

Figure SI 4: Attachment of Thiobacillus thioparus *cells on carbon steel substrates (2.5 cm x 3 cm) coated with different liquid-infused coatings. Images of the coupons before (day 0) and after (day 12) biofilm formation as well as after biofilm removal.*

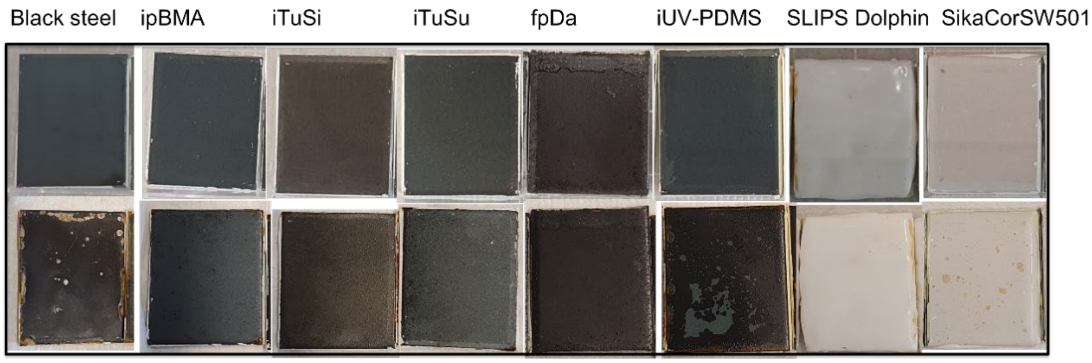

Figure SI 5: Selection of representative coupons (2.5 cm x 3 cm) before (top row) and after cultivation with Pseudomonas fluorescens*, removal of biofilm and drying (bottom row). The biofilm of this organism was much less visible to the eye (therefore not shown) and easier to remove than that of* Thiobacillus thioparus*.*

References

1 T. Walter, T. Hein, M. Weichselgartner, K. Wommer, M. Aust and N. Vogel, *Green Chem.*, 2022, **24**, 3009–3016.

2 K. E. Dehm, T. Walter, M. Weichselgartner, R. W. Crisp, K. Wommer, M. Aust and N. Vogel, *Adv. Mater. Interfaces*, 2023, **10**, 2202032.

3 S. Chiera, V. M. Koch, G. Bleyer, T. Walter, C. Bittner, J. Bachmann and N. Vogel, *ACS Appl. Mater. Interfaces*, 2022, **14**, 16735–16745.

4 A. B. Tesler, L. H. Prado, I. Thievessen, A. Mazare, P. Schmuki, S. Virtanen and W. H. Goldmann, *ACS Appl. Mater. Interfaces*, 2022, **14**, 29386–29397.

5 S. Amini, S. Kolle, L. Petrone, O. Ahanotu, S. Sunny, C. N. Sutanto, S. Hoon, L. Cohen, J. C. Weaver, J. Aizenberg, N. Vogel and A. Miserez, *Science (80-.).*, 2017, **357**, 668–673.

6 S. Chiera, C. Bittner and N. Vogel, *Adv. Mater. Interfaces*, 2021, **8**, 2100156.