Electronic Supplementary Material (ESI) for Environmental Science: Water Research & Technology.

Supporting Information

Development of a Fluidized Bed Reactor for Phosphorus Recovery from Rubber Industry Wastewater through Struvite Formation: Material Selection and Prototype

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Table S.1 The characteristics of the synthetic treated rubber industry wastewater.

Parameter	Value	Unit	Difference (%)*
pH	4.95±0.20	-	2.97
Reactive phosphorus	193.80±5.27	mg/L as PO_4^{3-} -P	3.14
Ammonium	1746.02±12.88	mg/L as NH_4-N	2.42
Magnesium	99.75±0.01	mg/L as Mg	1.37
Calcium	34.70±0.00	mg/L as Ca	1.70

*The value of synthetic wastewater which was different from the value of actual wastewater (%).

Table S.2 The arithmetic average roughness (Ra) of the materials investigated by AFM.

Material	Ra (nm) *
Stainless steel	0.0555 ± 0.0191
Acrylic	0.0168 ± 0.0010
Epoxy resin fiberglass	0.3105 ± 0.0685
Vinyl ester resin fiberglass	0.3483 ± 0.0637
Aluminium	0.1403 ± 0.0153
Galvanized steel	0.2810 ± 0.0333

* The testing distance from AFM analysis was 10 μm.

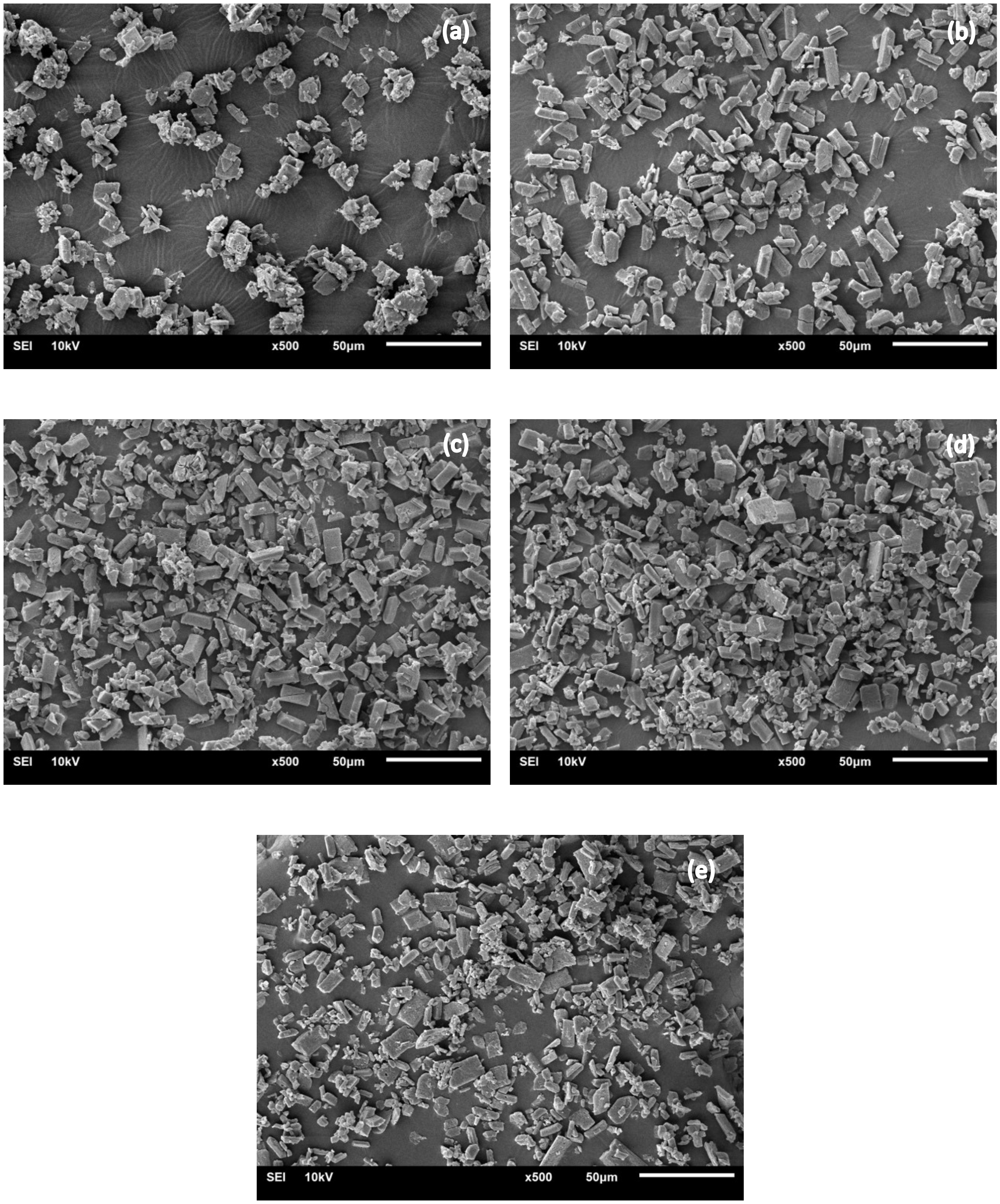


Figure S1. SEM images (500x) of struvite crystals from treated rubber industry wastewater at different pH values: (a) pH 7.5, (b) pH 8, (c) pH 8.5, (d) pH 9, and (e) pH 9.5.

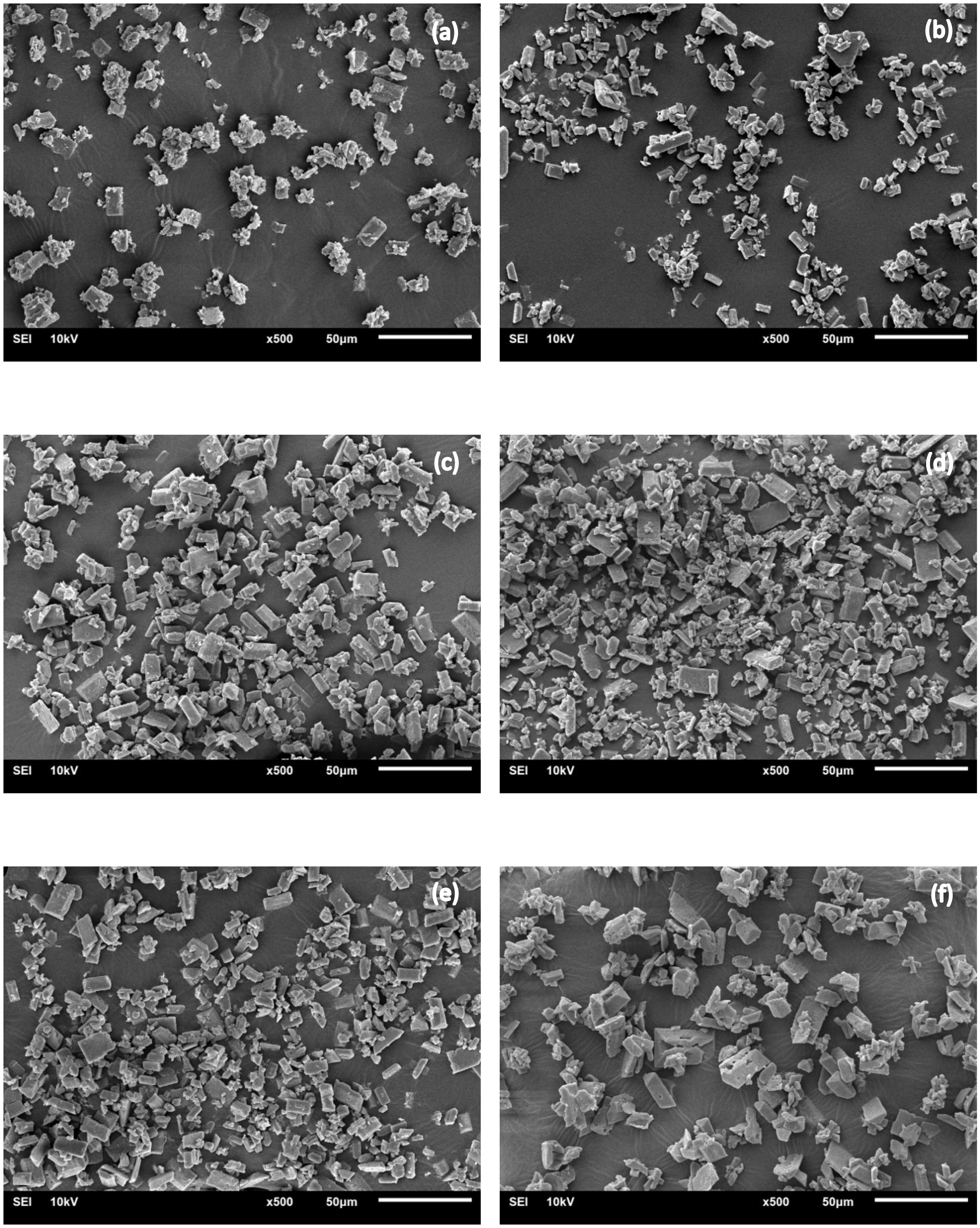


Figure S2. SEM images (500x) of struvite crystals from treated rubber industry wastewater at different Mg:P molar ratios: (a) 0.66:1, (b) 1.0:1, (c) 1.1:1, (d) 1.2:1, (e) 1.3:1, and (f) 1.5:1.

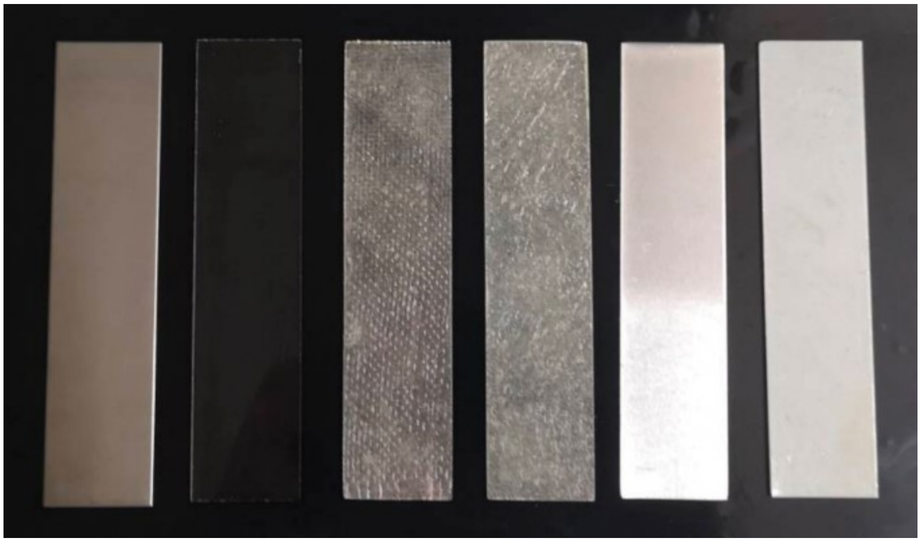


Figure S3. Materials before testing: stainless steel, acrylic, epoxy resin fiberglass, vinyl ester resin fiberglass, aluminum, and galvanized steel (left to right).

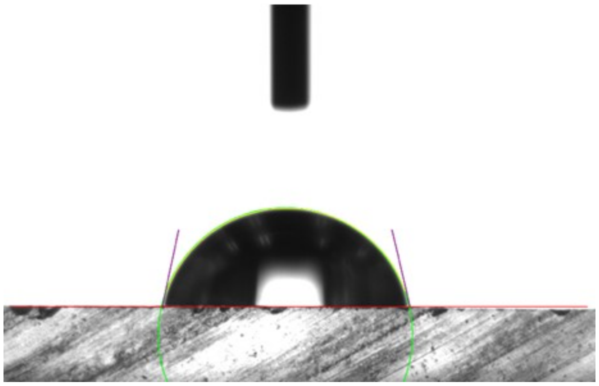
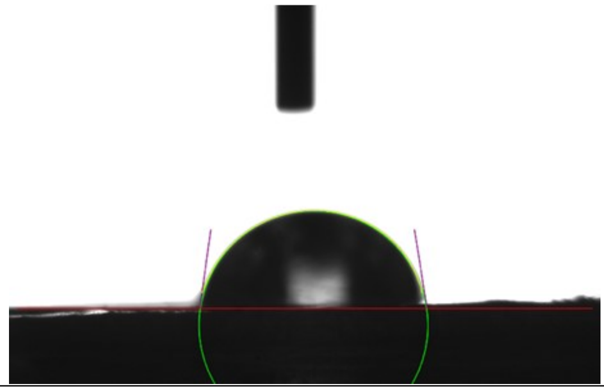
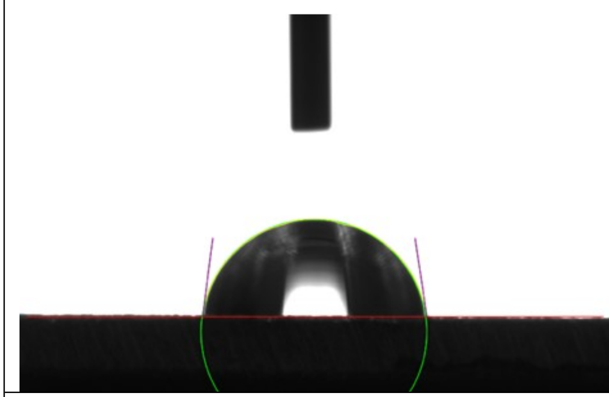
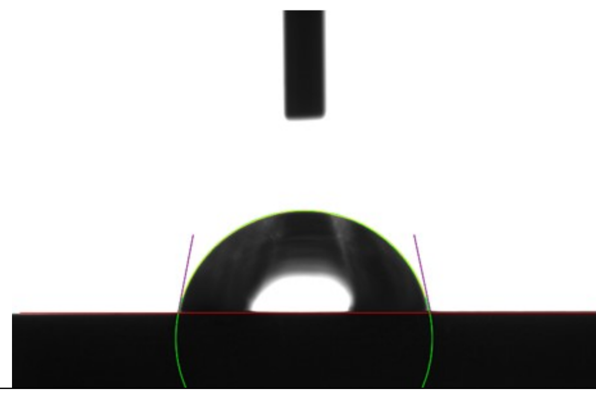
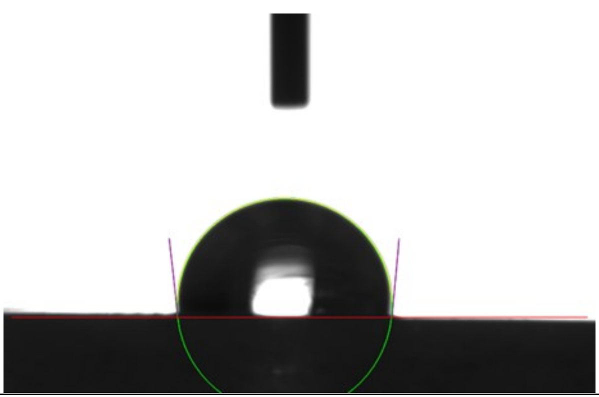
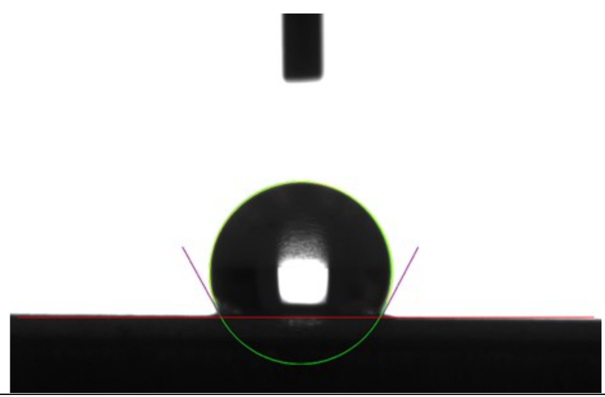
Acrylic	Vinyl ester resin fiberglass
	
Average contact angle = 77.16 ± 1.02	Average contact angle = 82.86 ± 2.21
Aluminium	Stainless steel
	
Average contact angle = 81.91 ± 1.91	Average contact angle = 79.86 ± 2.09
Epoxy resin fiberglass	Galvanized Steel
	
Average contact angle = 95.53 ± 0.86	Average contact angle = 119.48 ± 2.06

Figure S4. Contact angle images and average contact angle values of various materials.

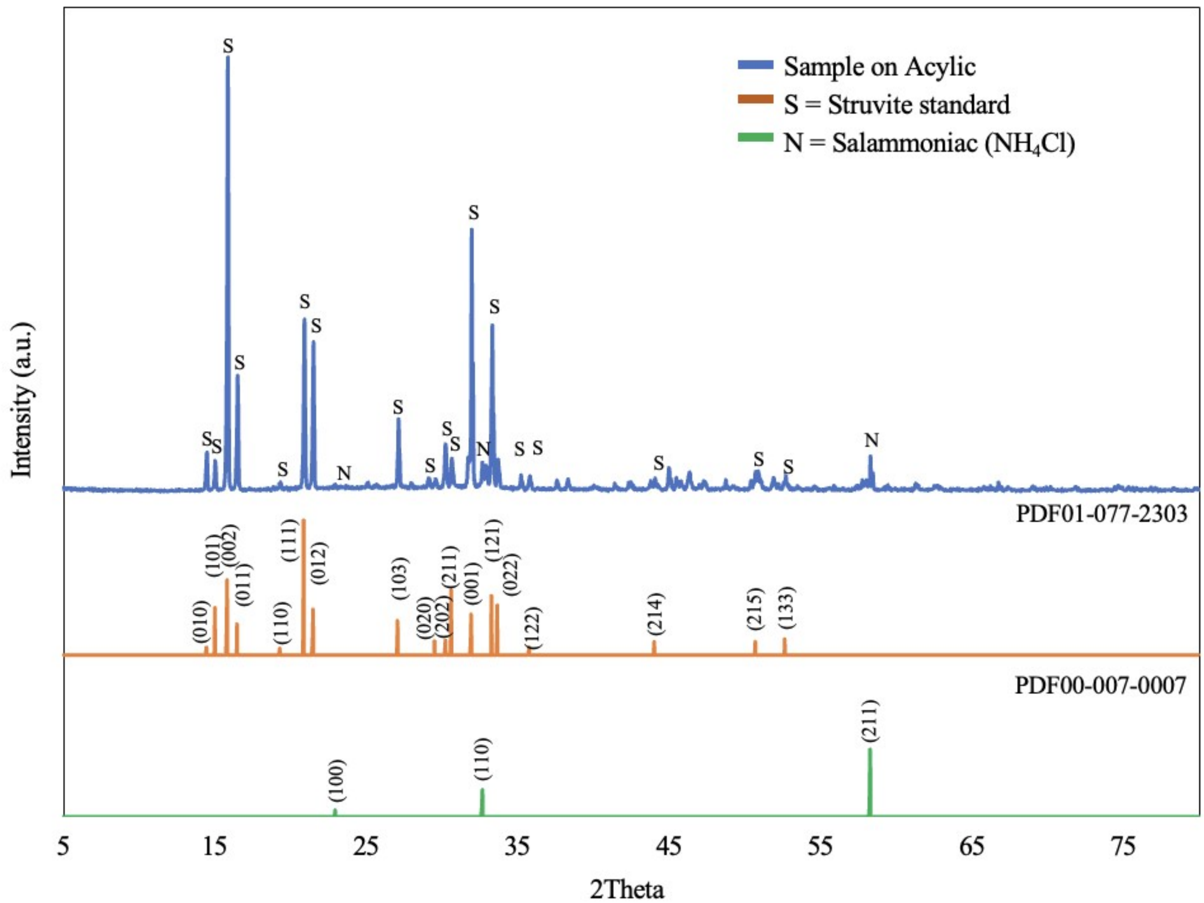


Figure S5. XRD patterns of scales on acrylic.

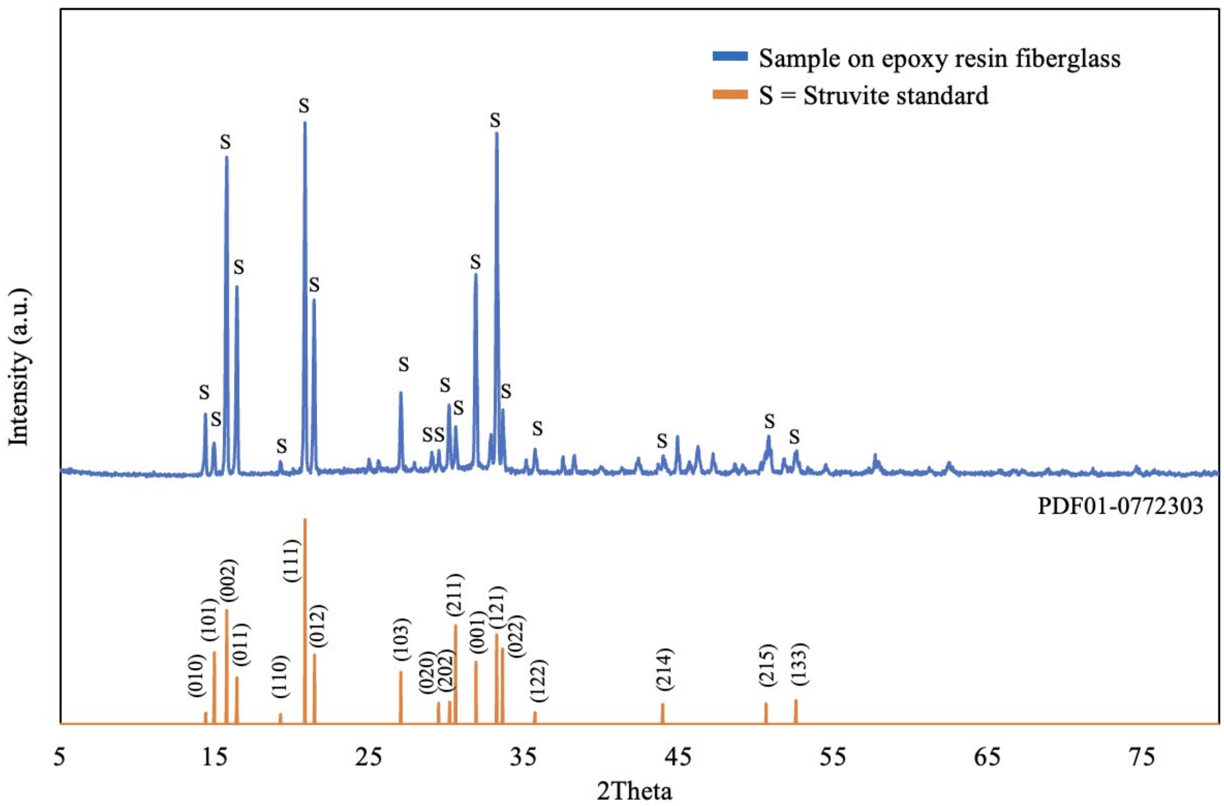


Figure S6. XRD patterns of scales on epoxy resin fiberglass.

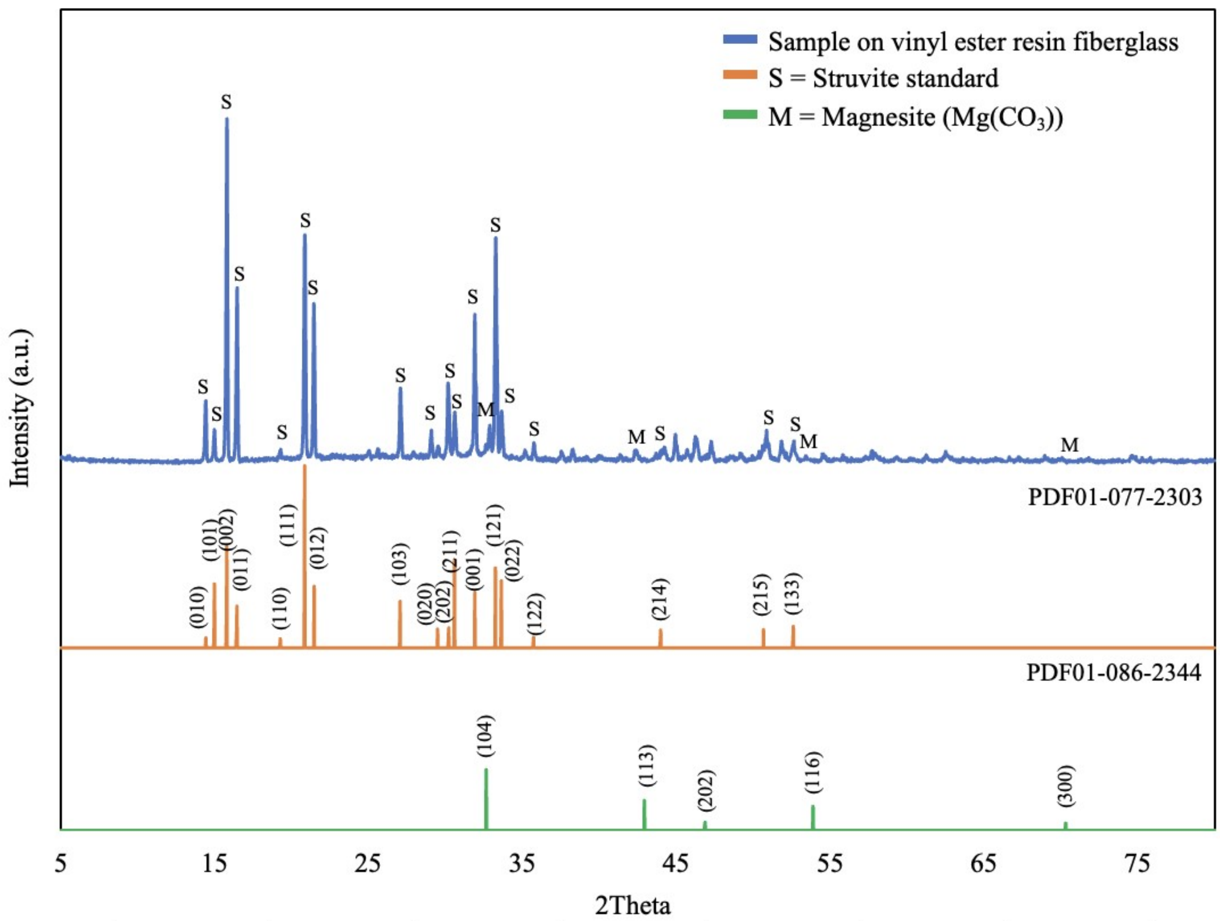


Figure S7. XRD patterns of scales on vinyl ester resin fiberglass.

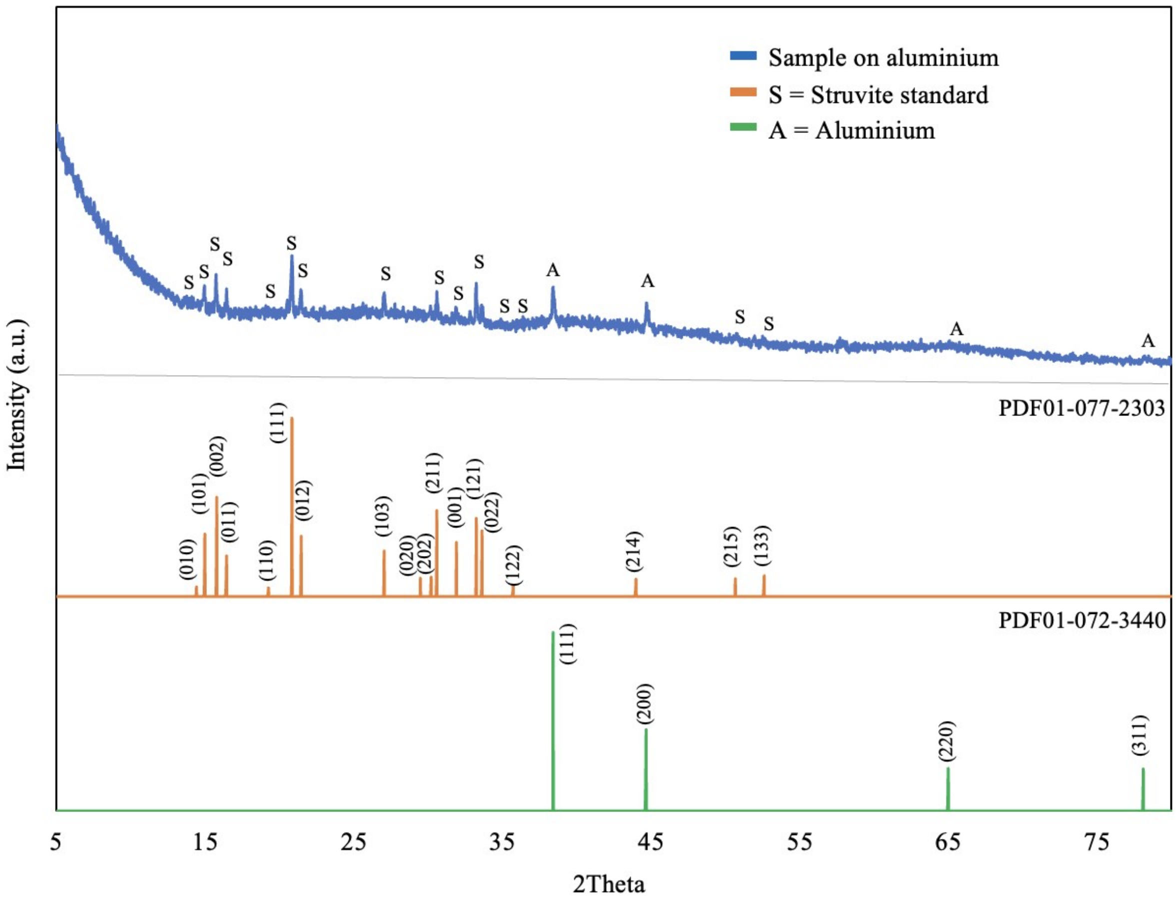


Figure S8. XRD patterns of scales on aluminum.

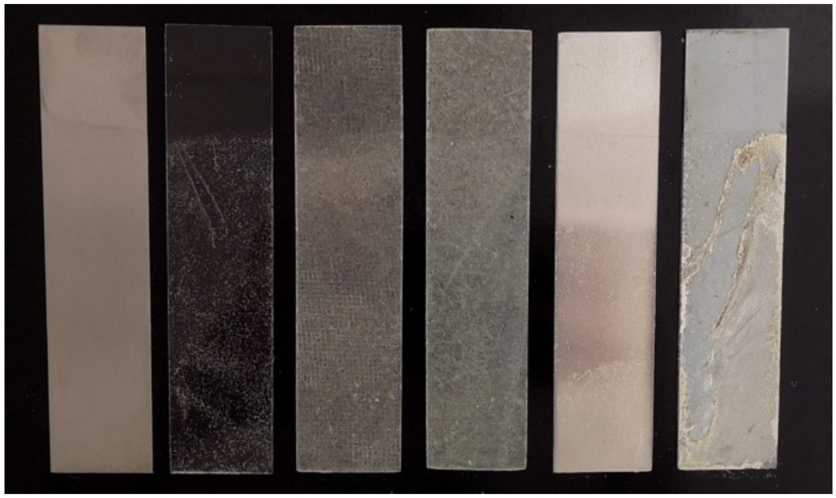


Figure S9. Materials after testing at 24 h: stainless steel, acrylic, epoxy resin fiberglass, vinyl ester resin fiberglass, aluminum, and galvanized steel (left to right).

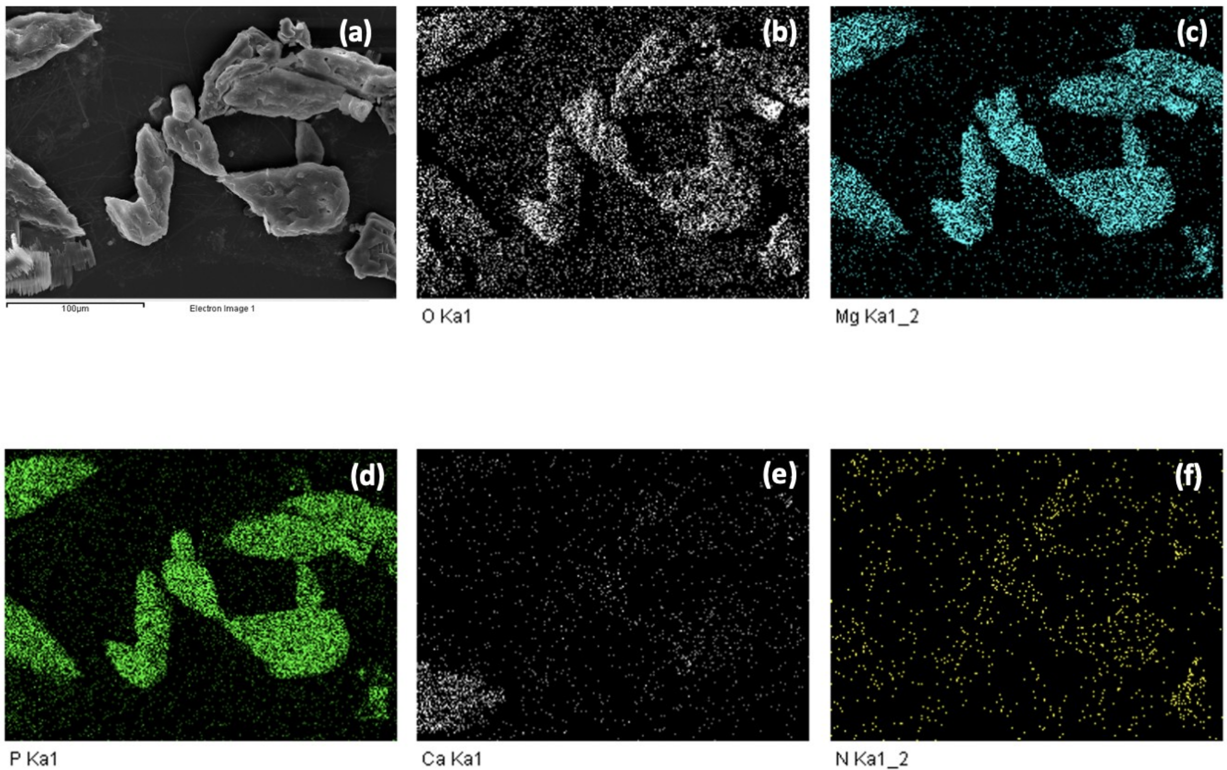


Figure S10. Energy-dispersive X-ray spectroscopy (EDS) mapping images of scales on acrylic, including (a) SEM image, (b) O element, (c) Mg element, (d) P element, (e) Ca element, and (f) N element.

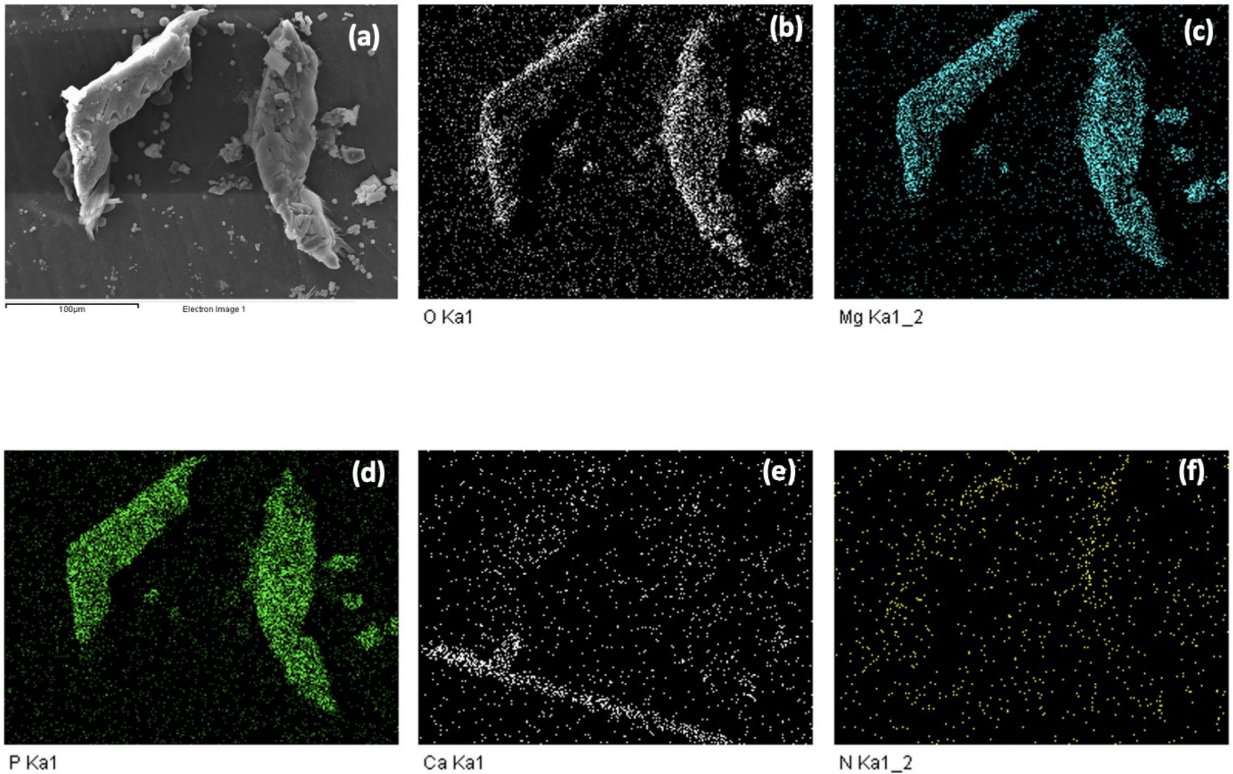


Figure S11. Energy-dispersive X-ray spectroscopy (EDS) mapping images of scales on epoxy resin fiberglass, including (a) SEM image, (b) O element, (c) Mg element, (d) P element, (e) Ca element, and (f) N element.

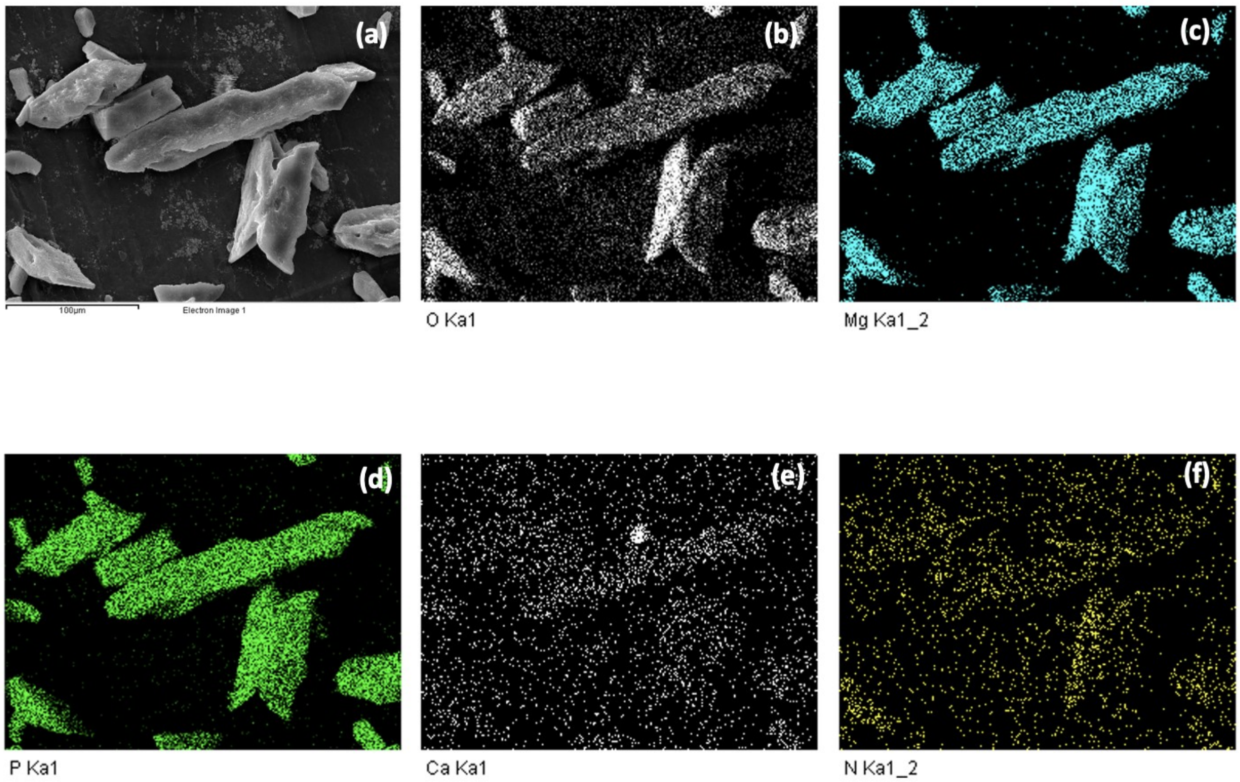


Figure S12. Energy-dispersive X-ray spectroscopy (EDS) mapping images of scales on vinyl ester resin fiberglass, including (a) SEM image, (b) O element, (c) Mg element, (d) P element, (e) Ca element, and (f) N element.

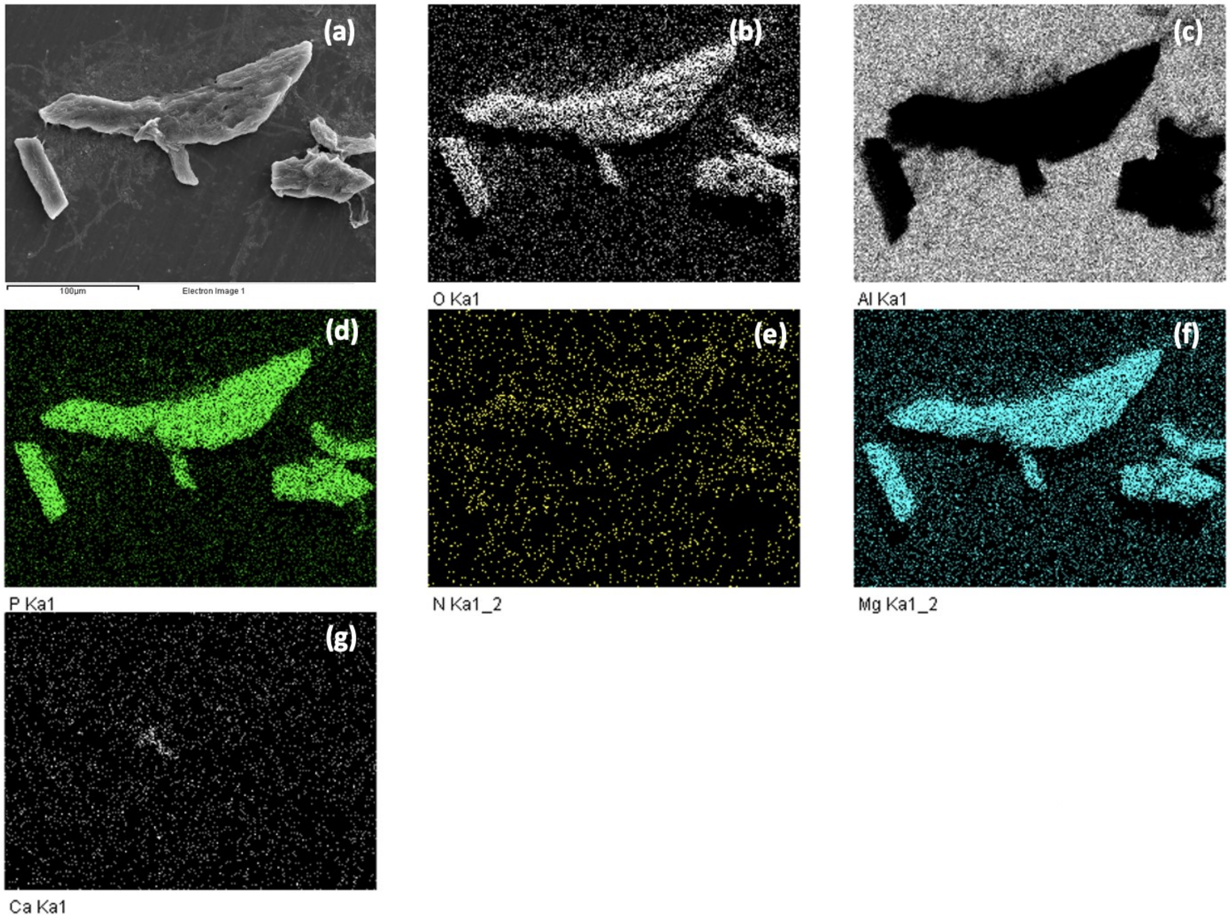


Figure S13. Energy-dispersive X-ray spectroscopy (EDS) mapping images of scales on aluminum, including (a) SEM image, (b) O element, (c) Al element, (d) P element, (e) N element, (f) Mg element, (g) Ca element.

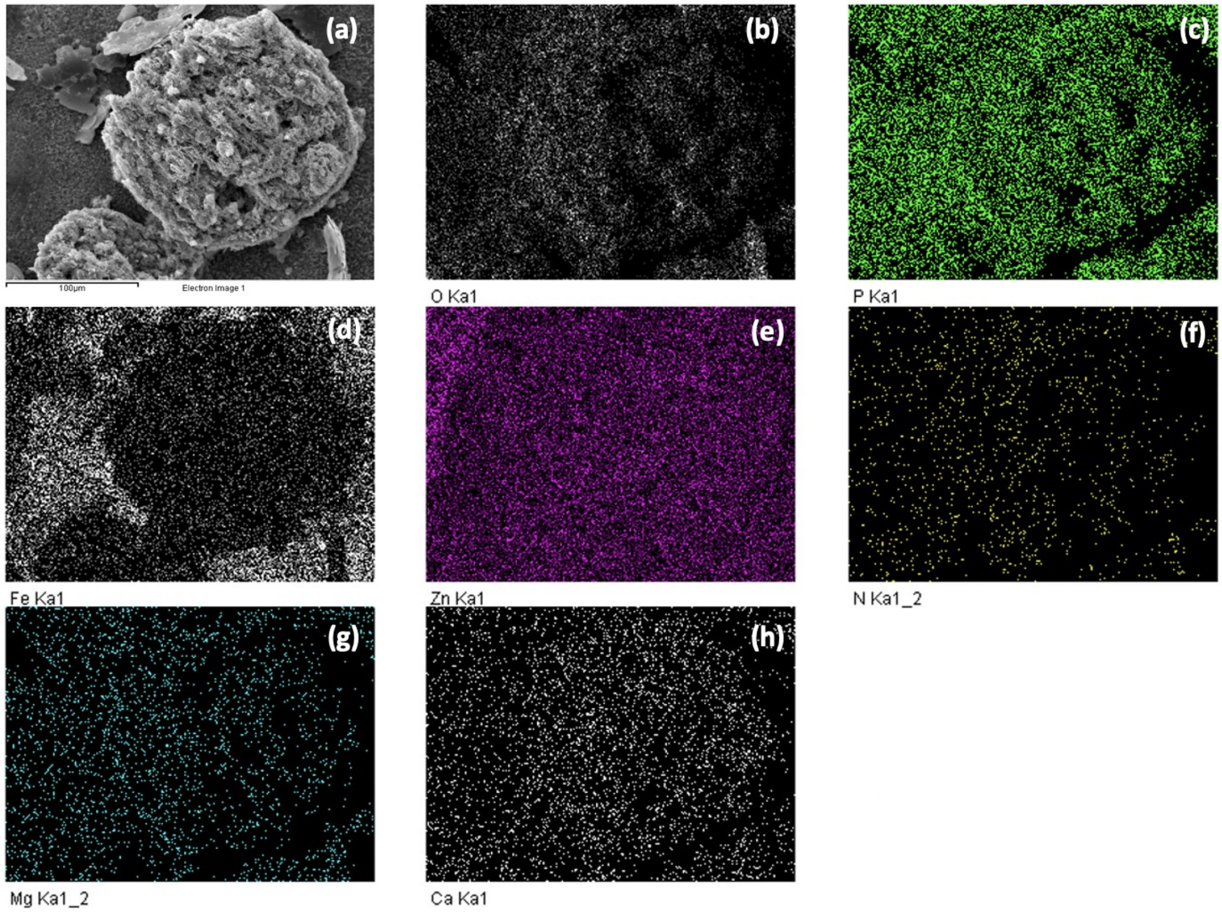


Figure S14. Energy-dispersive X-ray spectroscopy (EDS) mapping images of scales on galvanized steel, including (a) SEM image, (b) O element, (c) P element, (d) Fe element, (e) Zn element, (f) N element, (g) Mg element, and (h) Ca element.