

Supplementary Information

Carbon Fiber -Reinforced Thermoplastic Composite Coatings for Steel Pipelines

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Supplementary Table(s)

Table S1. Properties of Araldite®2011 adhesive as received.

Property	2011/A	2011/B	2011 (mixed)
Color - visual	Neutral	Pale yellow	Pale yellow
Specific gravity	1.15	0.95	1.05
Viscosity at 25 °C (Pas)	30-50	20-35	30-45
Pot life (100 gm at 25 °C)	-	-	100 minutes
Lab shear strength at 23 °C	-	-	> 19 MPa

Table S2. Fitting results obtained from the EIS measurements of the as-prepared coatings in 3.5 wt.% NaCl.

Sample	R_c $k \Omega$ cm^2	n_1	CPE1, μs^n Ohm^{-1} cm^{-2}	C_c , μF cm^{-2}	R_{ct} , $k \Omega$ cm^2	n_2	CPE2, μs^n Ohm^{-1} cm^{-2}	C_{dl} , nF cm^{-2}	W $\mu \Omega$ $cm^2 s^{-1/2}$
UD	38	0.656	32	34	48	0.752	26	63	--
Biaxial	356	0.788	4.6	5.2	445	0.815	0.02	7	--
Off-axis	190	0.678	16	25	226	0.787	0.1	36	18

Supplementary Figure(s)

Materials and Methods



Figure S1. Low carbon-steel plates



Figure S2. Araldite adhesive: Araldite® 2011/A & Araldite® 2011/B

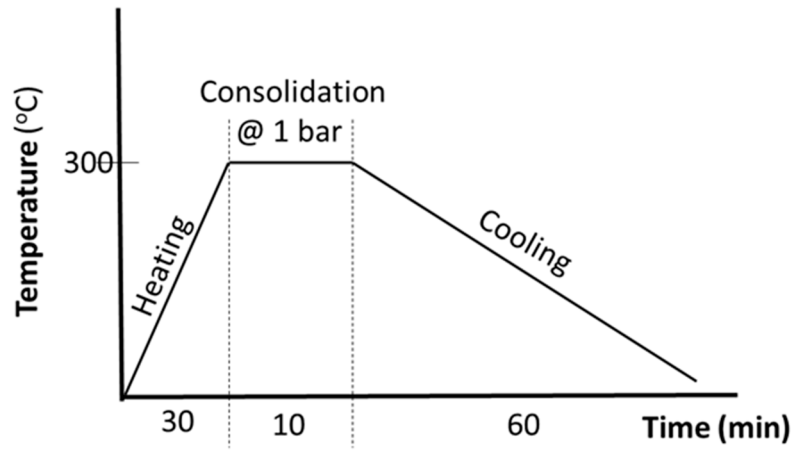


Figure S3. Consolidation profile used for manufacturing the CF/PPS composites

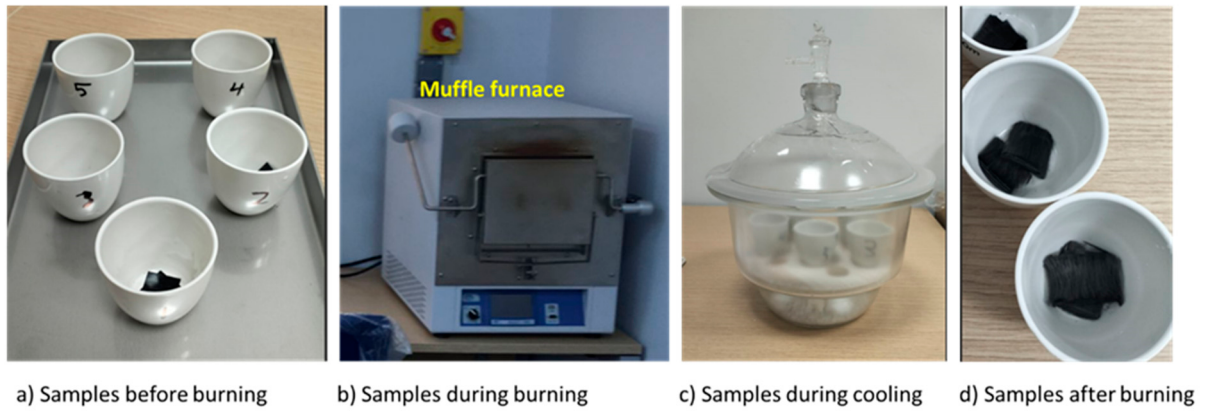


Figure S4. Burn-off process for composite specimens.

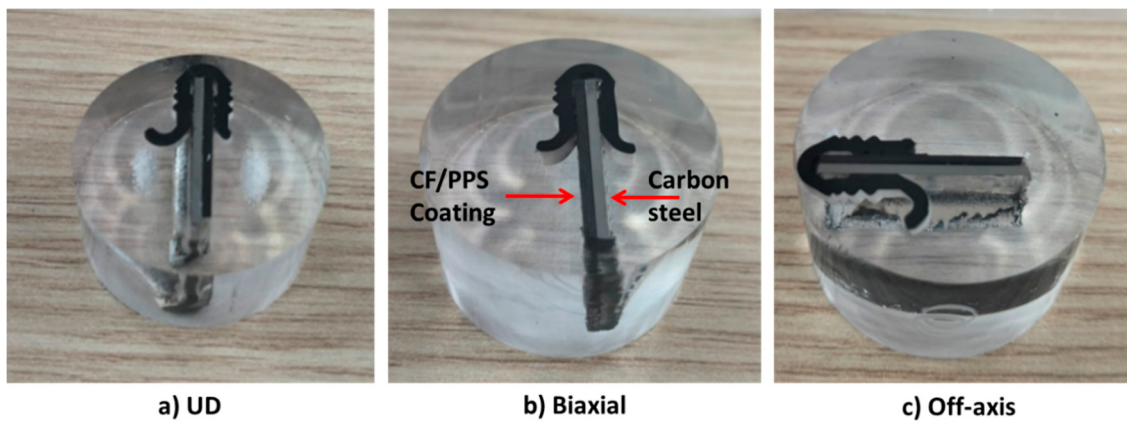


Figure S5. Microsections for optical microscopy.

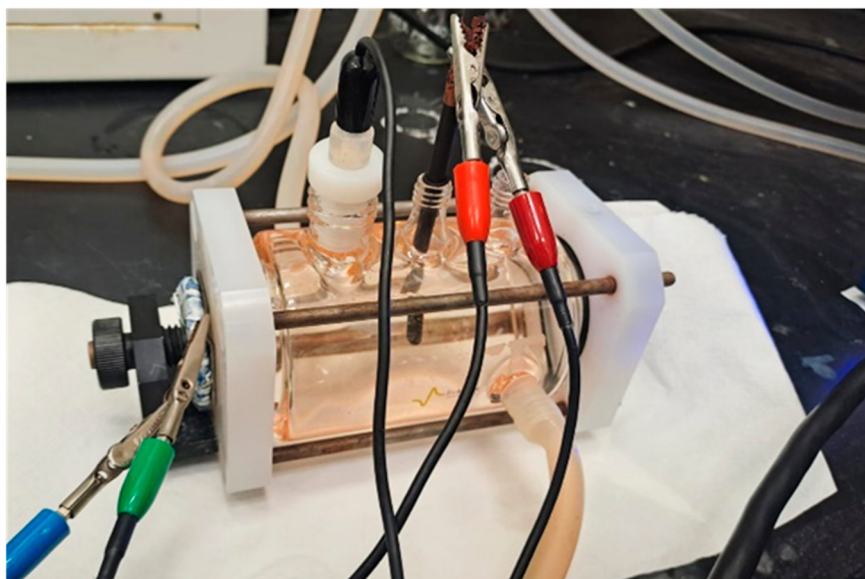
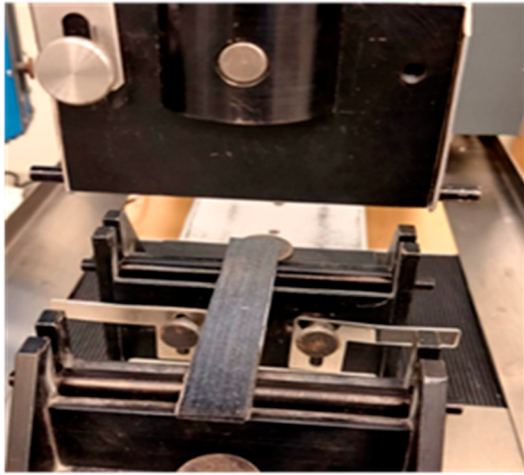
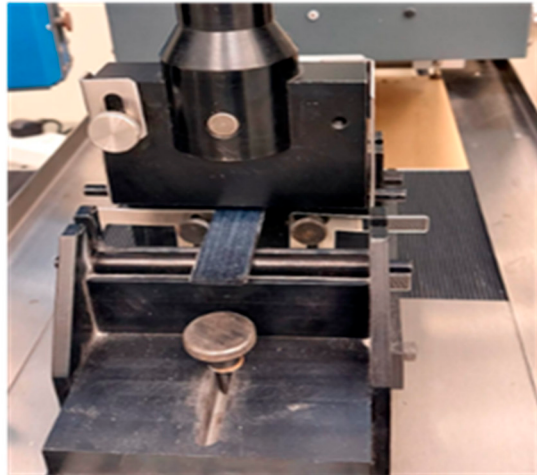


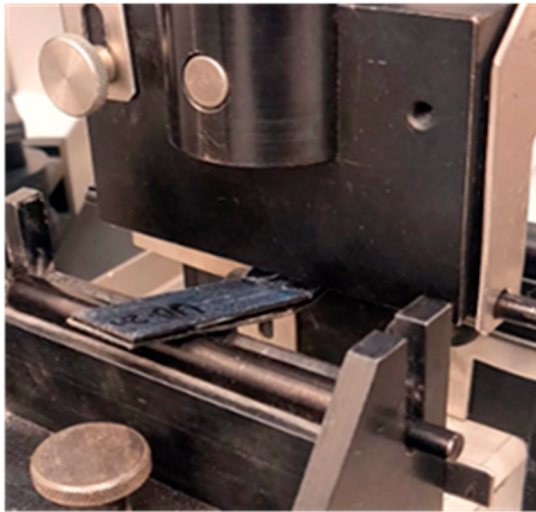
Figure S6. Setup for Electrochemical Impedance Spectroscopy (EIS) used in corrosion measurement experiments



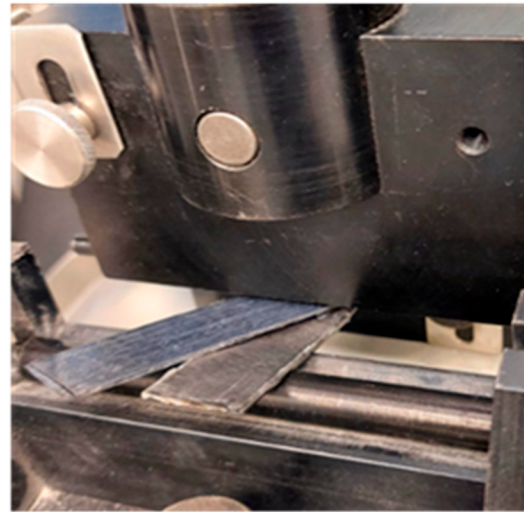
a) Sample before flexural test



b) Sample at the beginning of the test



c) Sample starts to fail during the test



d) Sample failure at the end of the test

Figure S7. Set up of 3-point bending test includes steps of flexural failure of test sample.

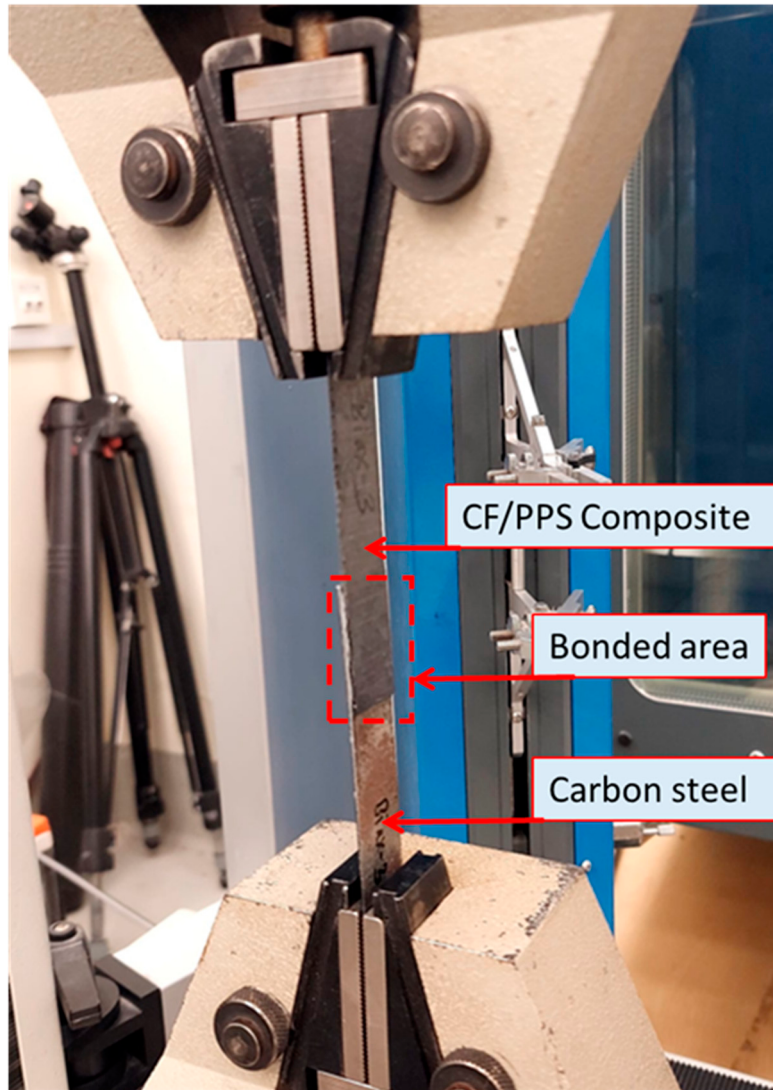


Figure S8. Set up of Single-Lap shear test.

Results and Discussion

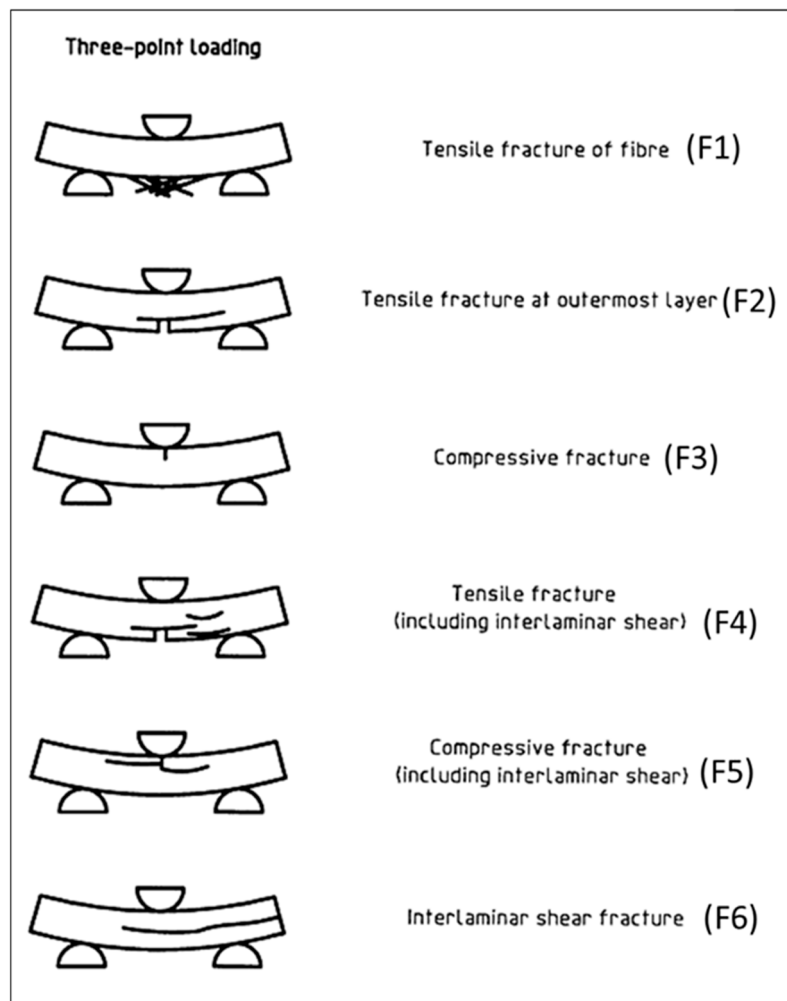


Figure S9. Examples of possible flexural failure modes [1].

References

- [1] In: BS EN ISO 14125, Fibre-reinforced plastic composites—Determination of Flexural properties. 1998.