

Appendix A. Supplementary Data

Sustainable Bio-Based Isocyanate-Free Poly (Urethane Amic Acid) Coatings for Corrosion Protection of Mild Steel

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Table of Contents

Contents	Page No.
Section S1	S3
Table S1	S3
Table S2	S3
Table S3	S3
Figure S1	S4
Figure S2	S4
Table S4	S5
Table S5	S6

Section S1. Physicochemical Properties of Castor Oil, Epoxidised Castor Oil and Carbonated Castor Oil:

Table S1. Physicochemical Properties of Castor Oil (CO)

Property	Units	Value
Colour and Appearance	-	Light yellow viscous liquid
Acid Value	mg KOH/g	1.27
Hydroxyl Value	mg KOH/g	170
Moisture content	% w/w	≤ 0.2
Iodine Value	g/100 g	82-90
pH	-	6.5-7.0

Table S2. Physicochemical Properties of Epoxidised Castor Oil (CO)

Property	Units	Value
Colour and Appearance	-	Pale yellow viscous liquid
Acid Value	mg KOH/g	<1.0
Oxirane Value	%	4.6-4.7
Moisture content	% w/w	0.15 max
Iodine Value	g/100 g	<8
pH	-	6.5-7.0

Table S3. Physicochemical Properties of Carbonated Castor Oil (CO)

Property	Units	Value
Colour and Appearance	-	Dark Yellow viscous liquid
Acid Value	mg KOH/g	<2.0
Oxirane Value	%	0.03-0.05
Moisture content	% w/w	0.05
Iodine Value	g/100 g	<5
pH	-	6.5-7.0

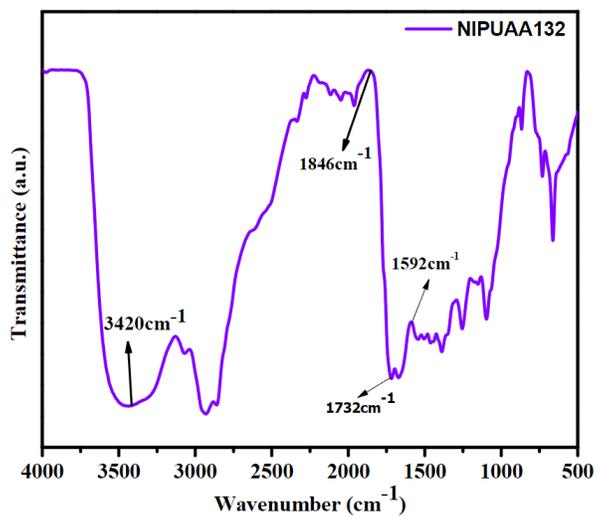


Figure S1. FTIR spectra of NIPUAA-132

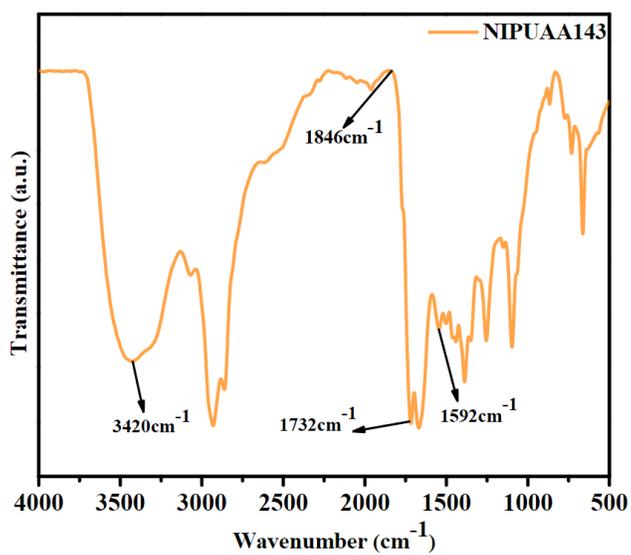


Figure S2. FTIR spectra of NIPUAA-143

Table S4. Salt Spray Fog Test Panels (up to 120 h) of NIPUAA Composites coated on MS panels

Sample/Hour	NIPUAA-121	NIPUAA-132	NIPUAA-143
0h			
24h			
48h			
72h			
96h			
120h			

Table S5: Comparative Table of previously reported literature with Anticorrosion data

S.No.	Polyol (Biobased/Synthetic)	Isocyanate Source [PU/NIPU]	Anticorrosion Studies		References
			Corrosion Rate (mm/year)	Polarization Resistance (MΩ)	
1.	Cardanol	Tolonate TM HDB 75 MX polyisocyanate	8.83×10^{-3}	0.037325	DOI: 10.1016/j.porgcoat.2021.106586
2.	Epoxidised Soyabean Oil (Biobased)	Tetraethylene Pentamine (Non-Isocyanate)	1.67×10^{-5}	7.38	DOI: 10.3390/suschem4010008
3.	PTMEG (Synthetic)	Isophorone diisocyanate (Isocyanate)	6.874×10^{-6}	55.91	DOI: 10.1002/app.54507
4.	Castor Oil (Biobased)	1,1,2-diamino dodecane (Non-isocyanate)	Not mentioned	Not mentioned	DOI: 10.1039/D3NJ05862J
5.	Castor Oil (Biobased)	Isophorone diamine and Pyromellitic dianhydride (Non-Isocyanate)	2.97×10^{-6}	148.64	This Work