Supporting Information

Ultra-robust icephobic coatings with high toughness, strong substrate adhesion and self-healing capability

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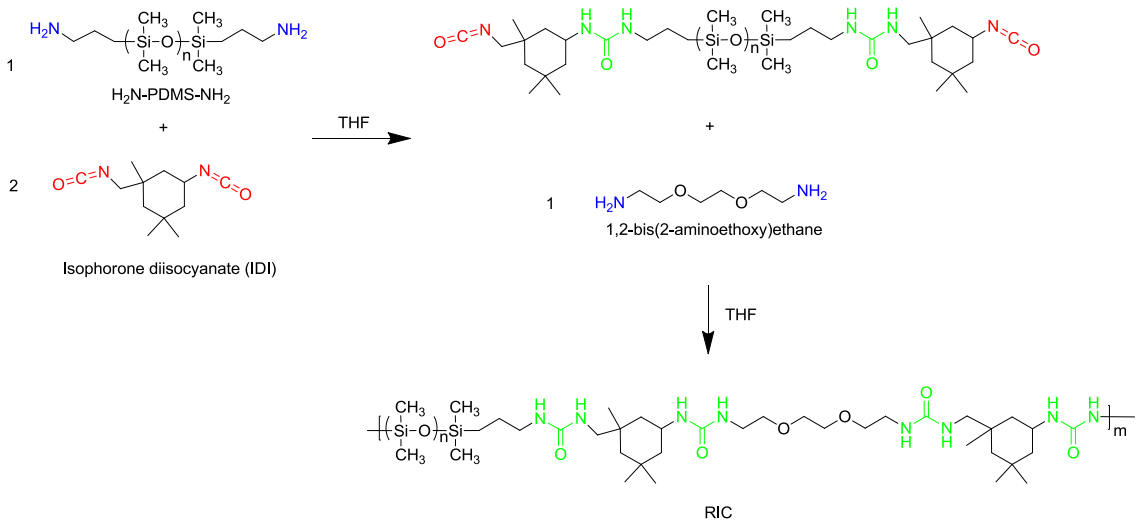

Figure S1 Synthesis route of RIC.

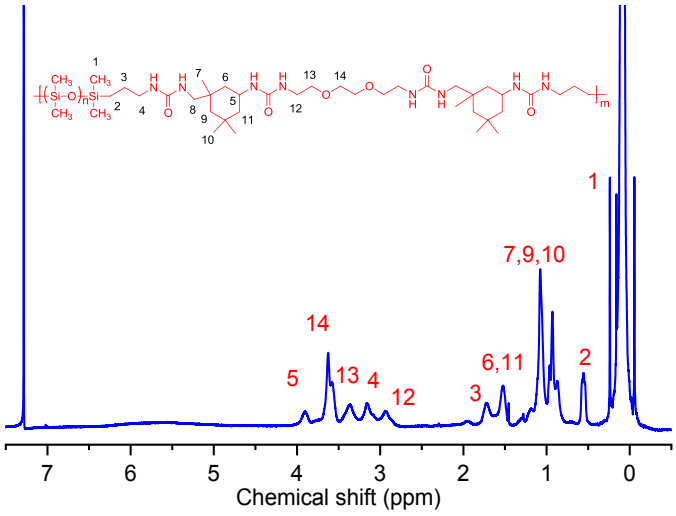

Figure S2 ^{1}H NMR of RIC.

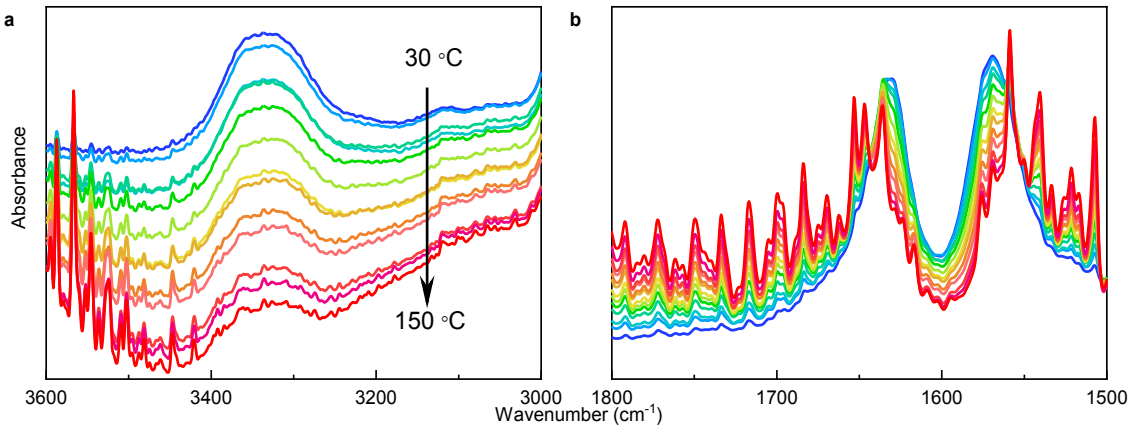

Figure S3 FTIR spectra of RIC from 30 to 150 °C.

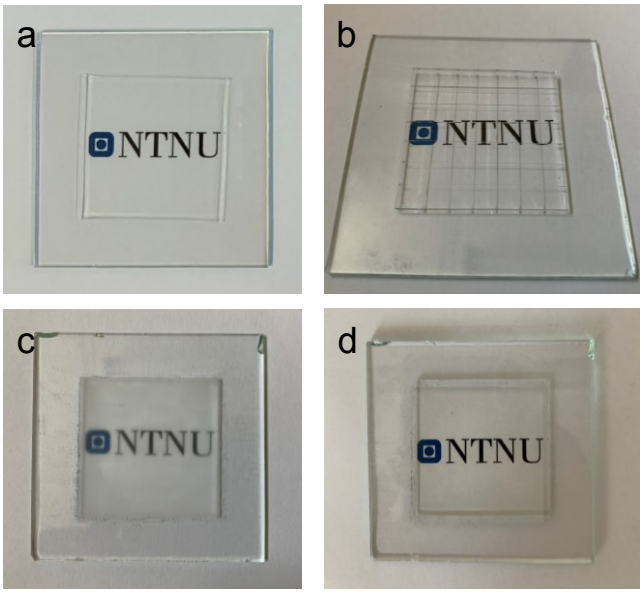

Figure S4 Images of RIC in different states. (a) Fresh RIC. (b) Cut RIC before ice adhesion testing. (c) RIC after 1000 abrasions. (d) Healed RIC from 1000 abrasions. The coating is applied onto a 6 × 6 cm^2 glass substrate.

Figure S5 Water contact angles. (a) Static water contact angle. (b) Advancing contact angle. (c) Receding contact angle. To obtain the dynamic contact angle, 5 μL of deionized water was placed on the surface, followed by expanding and shrinking of deionized water at a rate of 0.1 mL/min via the needle of the syringe. The process was recorded by a camera. Advancing contact angles were obtained from the snap-shot during expanding process while receding contact angles were obtained from the one during the shrining process.

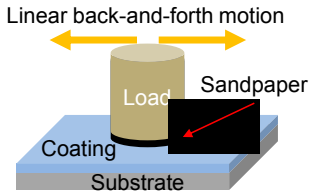

Figure S6 Schematic of abrasion cycles.

Table S1

Sample	Solution	Coating method	Amount	Thickness (μm)
RIC-1	Diluted with 3 times of THF	Solvent casting	4 mL	68 ± 7
RIC-2	Prepared solution		4 mL	470 ± 15
RIC-3	Prepared solution		8 mL	1009 ± 67
Sylgard 184-1	Base/curing agent: 10/1	Drip coating	1.6 g	795 ± 22
Sylgard 184-2			0.8 g	316 ± 22
Sylgard 184-3		Spin coating	3 g, 500 rpm	99 ± 2
Sylgard 184-4			3 g, 759 rpm	85 ± 2

Table S2

Sample	S^a (N/m)	Er^b (MPa)	E^c (MPa)	H^d (MPa)	Rq^e (nm)	Ra^f (nm)	$Rmax^g$ (nm)
RIC	31.62 ± 0.10	5.27 ± 0.02	3.95 ± 0.02	1.70 ± 0.01	0.567	0.451	5.06
Sylgard 184	19.4 ± 0.04	2.83 ± 0.01	2.12 ± 0.01	1.30 ± 0.01	--	--	--

a) Stiffness
b) Reduced modulus
c) Young's modulus
d) Hardness
e) Root mean square roughness
f) Mean roughness
g) Maximum roughness depth

Table S3

Sample	Rq^a (nm)	Ra^b (nm)	Rp^c (nm)	Rt^d (nm)	Rv^e (nm)
Before abrasion	7.905	6.272	39.412	75.592	-36.181
After abrasion	1127	867	16205	26931	-10727
Healed	19.443	10.845	863.277	5093	4229

a) Root mean square roughness
b) Mean roughness
c) Maximum peak height
d) Maximum peak to valley height
e) Maximum valley depth