

Supporting Information

High-Strength Millable Polydimethylsiloxane-based Polyurethane Elastomer with a Broader Application Temperature Range

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1. Experimental Section

Table S1 Materials information

Materials	Model	Manufacturer
Hydroxyl-terminated polydimethylsiloxane (HTP DMS)	$M_n=2000$ g/mol, $M_w=3000$ g/mol	Shandong Dongyue Organosilicon Material Co., Ltd., China
Diphenylmethane-4,4'- diisocyanate (MDI)	AR	Shanghai Aladdin Biochemical Technology Co., Ltd., China
Tetrahydrofuran (THF)	AR	Tianjin Fuyu Chemical Co., Ltd., China
Dibutyltin dilaurate (DBTDL)	AR	Shanghai Aladdin Biochemical Technology Co., Ltd., China
Silica-1	H2000	Wacker Chemie AG
Silica-2	TS530	Cabot Corporation
Silica-3	HB612	Hubei Huifu Nanomaterials Technology Co., Ltd., China
2,4-Di-tert- butylperoxyisopropylphenyl (BIBP)	Industrial grade	Lanzhou Additive Factory Co., Ltd., China
2,5-Dimethyl-2,5-bis (tert-	Industrial grade	Jiangsu Qiangsheng

butylperoxy) hexane (DBPH)		Functional Chemicals Co., Ltd., China
Triphenylmethane-4,4',4''- triisocyanate (TTI)	27% ethyl acetate	Shanghai Meryer Biochemical Technology Co., Ltd., China.
Polymethylene polyphenyl isocyanate (PAPI)	AR	Beijing Merda Technology Co., Ltd., China
Polyisocyanates based on hexamethylene diisocyanate (HT-100)	HT-100	Yantai Wanhua Chemical Group Co., Ltd., China

2. Supplementary Figures

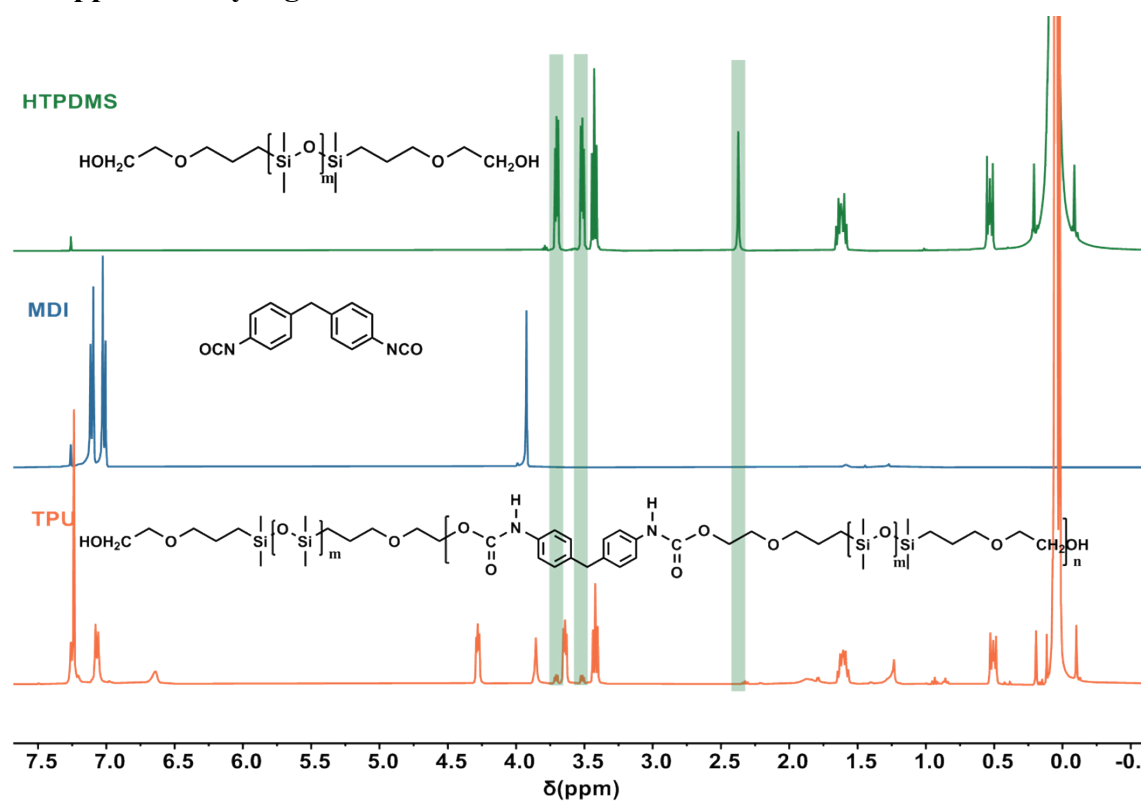


Fig. S1 ^1H NMR spectra of the HTPDMS, MDI and TPUs.

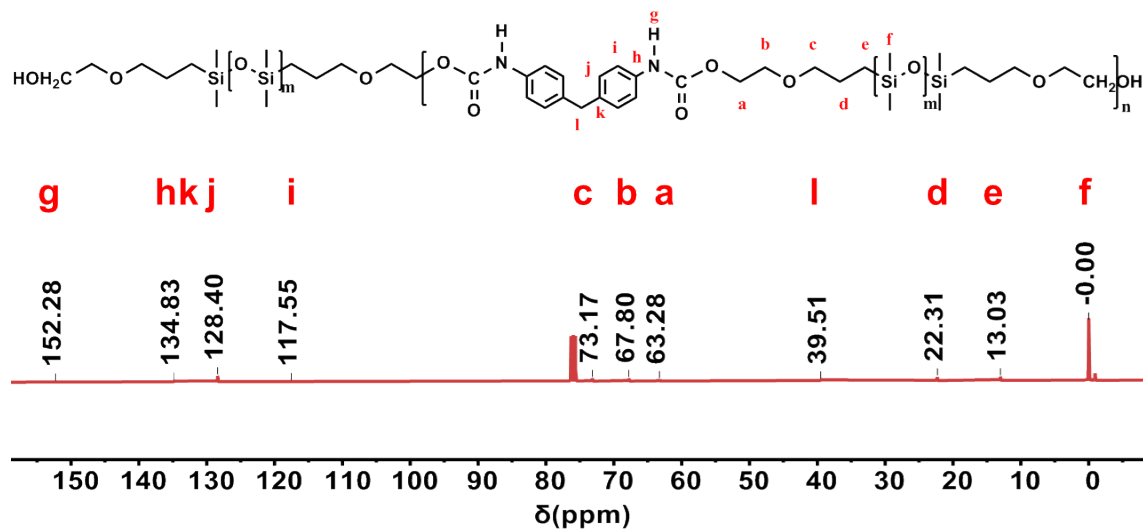


Fig. S2 ^{13}C NMR spectra of the TPUs.

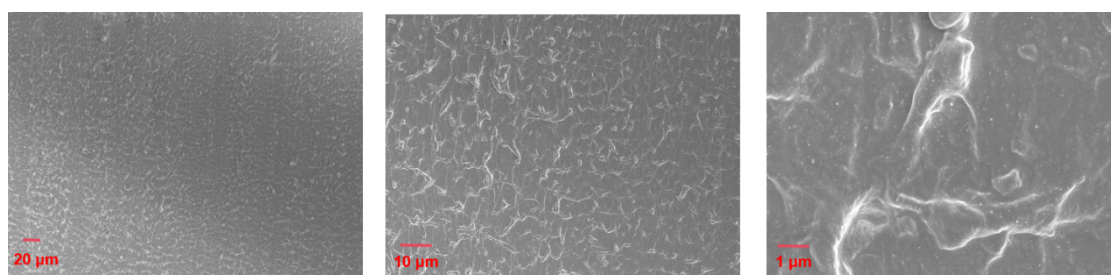


Fig. S3 SEM phase images of the MPUs.

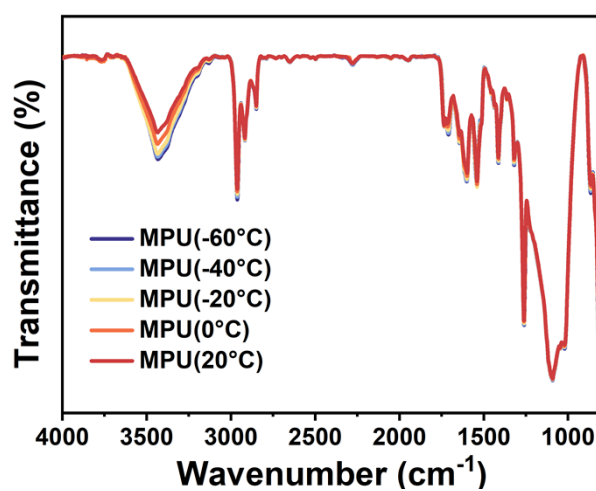


Fig. S4 FTIR spectra of MPUs at different temperatures.

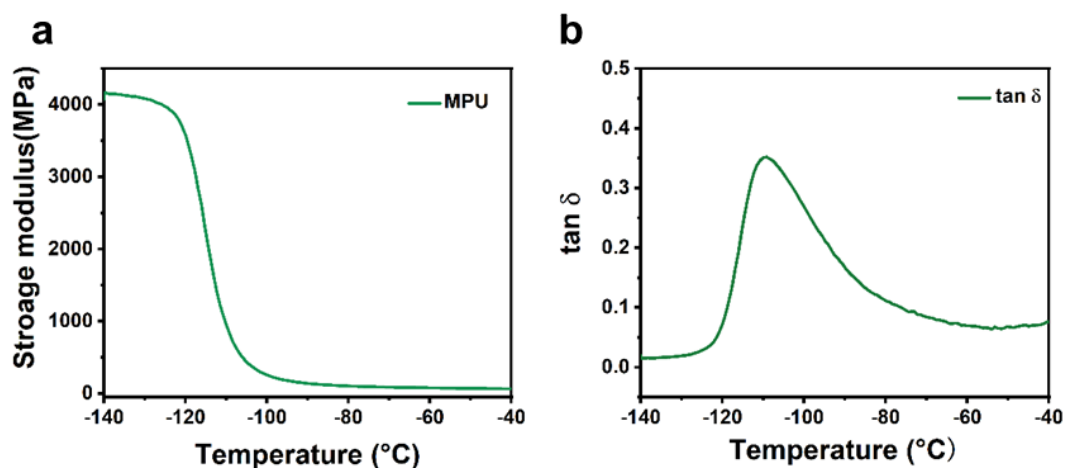


Fig. S5 Dynamic viscoelastic curves of MPUs (a) Storage modulus versus temperature; (b) Tan δ versus temperature.

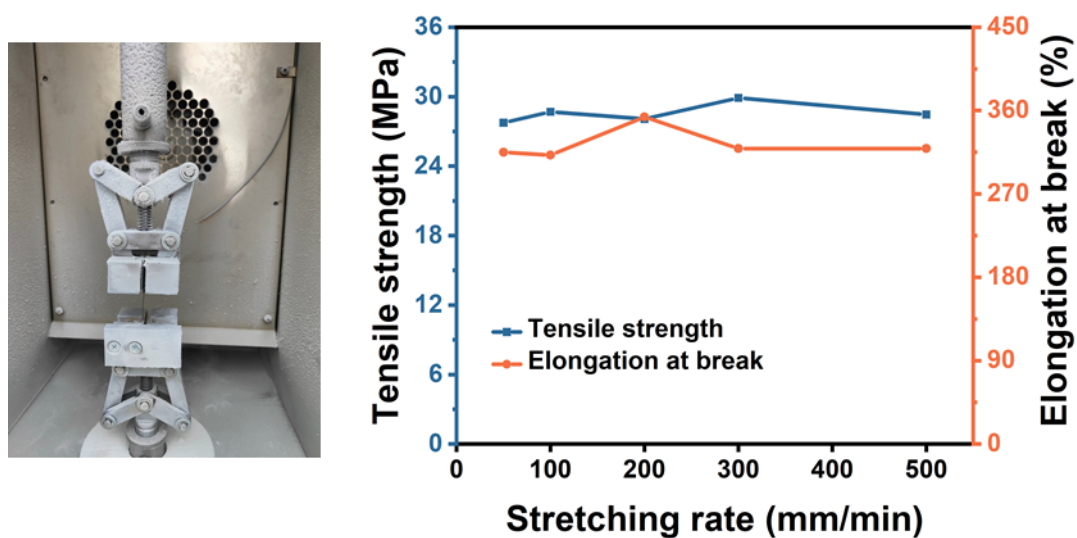


Fig. S6 Stress-strain curves of MPUs at -60 °C for different tensile rates.

Table S2 Tensile strength and elongation at break of MPUs at -60 °C for different strain rates.

Strain rate (s ⁻¹)	Tensile rate (mm/min)	Tensile strength (MPa)	Elongation at break (%)
0.04	50	27.75	315
0.08	100	28.69	312
0.17	200	28.07	353
0.25	300	29.89	318
0.42	500	28.46	319

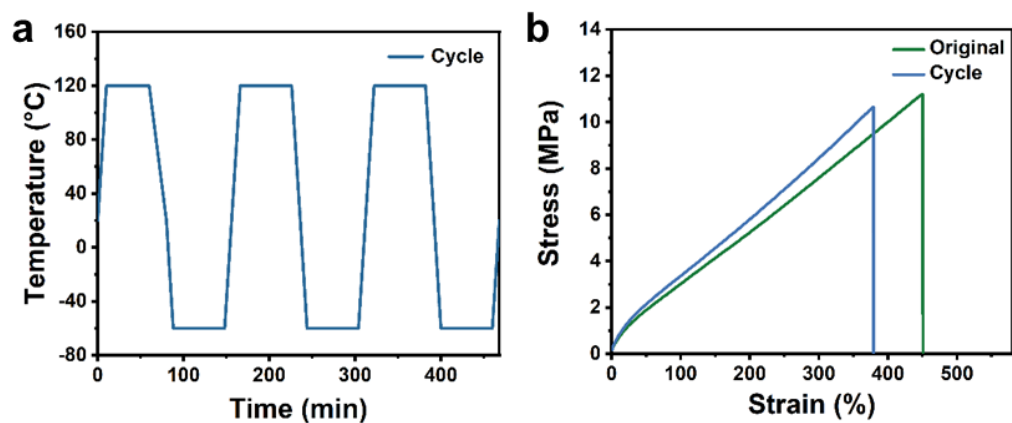


Fig. S7 (a) Schematic of the cyclic process; (b) Stress-strain curves of MPUs after cycling.

3. Supplementary Movies

Movies S1, S2, S3. (a) (b) Movies of the bending test processes of MPUs at 20 °C and -100 °C; (c) Movie of the recovery process after freezing in liquid nitrogen for 3h.

