Support Information

Solvent-Free and Photocurable Polyimide Inks for 3D Printing

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Table S1 GPC results of polyimide oligomer

Sample	Mn	Mw	Mz	Mz/Mw
PI-g-GMA	6973	16715	40913	2.447757

Table S2 Thermal properties of polyimide oligomer

polyimide	T_g	T_5	T_{10}	T_{max}	CR(%)
PI	273	428.21	466.11	472	36.06
Pi-g-GMA	272	407.14	459.74	469	37.08

T_5 and T_{10}: Temperature at a 10% or 20% weight loss

T_{max}: Temperature at the maximum degradation

CR: Char Residual at 800 °C in nitrogen

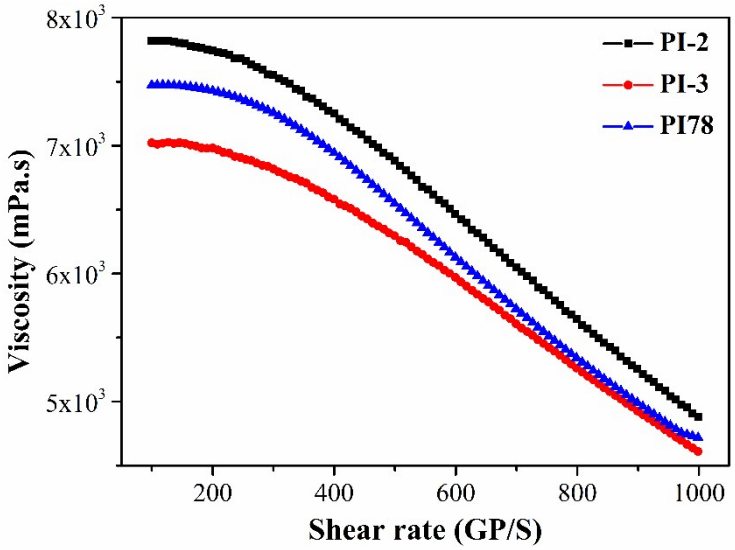

Fig. S1 Viscosity curves of photo-curing polyimides inks: PI-2, PI-3 and PI78, PI78 is defined as the content of LMA and PEG400DA is 7 and 8.

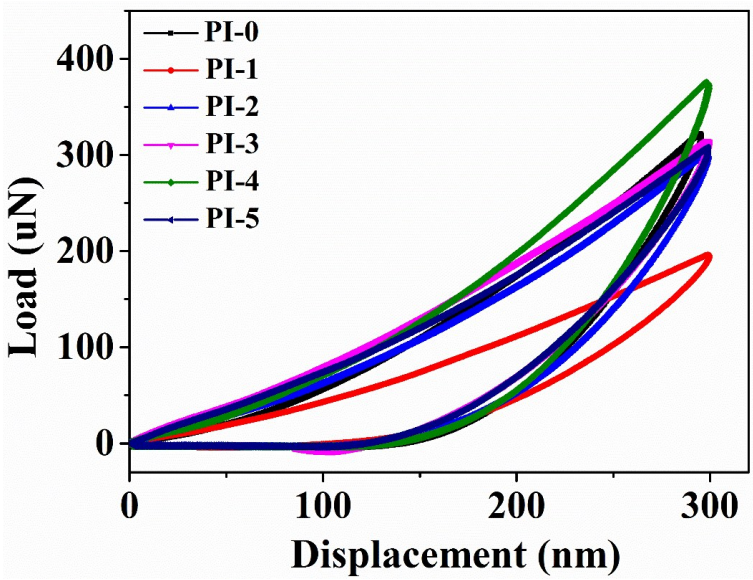

Fig. S2 The typical load-displacement curve of the UV-cured polyimides ink.

Table S3 mechanical behaviors of UV cured polyimide inks

Materials	Hardness (MPa)	Tensile strength (MPa)	Elongation (%)	Modulus (GPa)
PI-0	167.82±14.74	5.83±0.81	5.29±5.85	2.61±0.20
PI-1	109.84±28.51	9.63±1.41	7.70±1.60	1.37±0.07
PI-2	150.13±2.93	16.13±3.10	5.10±2.29	2.48±0.07
PI-3	165.12±27.09	24.93±3.13	5.43±1.08	2.16±0.10
PI-4	183.30±11.23	19.55±2.40	5.04±0.71	3.17±0.06
PI-5	170.17±1.27	11.99±2.43	11.85±3.22	2.14±0.02

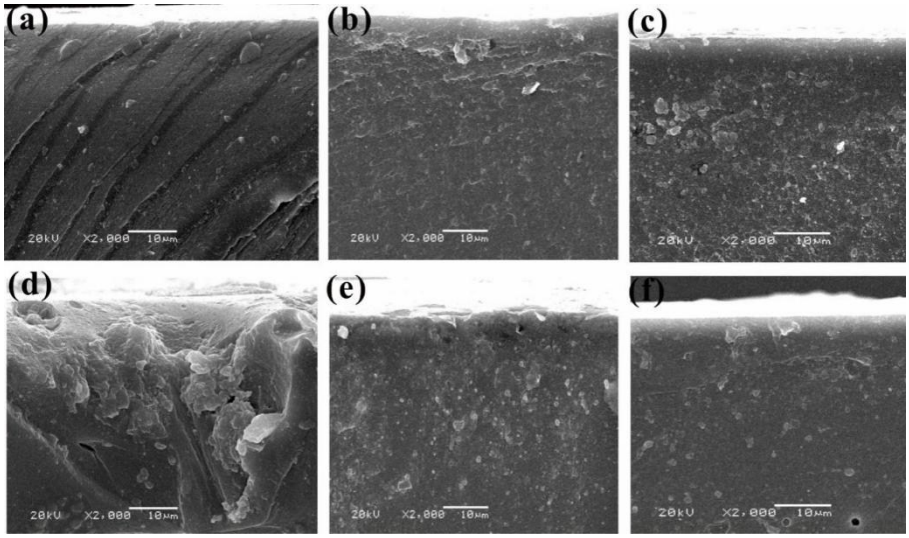

Fig. S3 SEM images of a tensile fracture surface of the UV cured polyimide inks: (a) PI-0, (b) PI-1, (c) PI-2, (d) PI-3, (e) PI-4, (f) PI-5.

Table S4 Thermal properties of UV cured polyimide inks

Materials	T_5[a]	T_{10}[b]	T_{max}[c]	CR(%)[d]
PI-0	335.97	367.17	443.56	28.32
PI-1	349.23	374.02	432.77	24.73
PI-2	350.45	375.85	434.36	24.69
PI-3	351.16	376.75	434.56	25.23
PI-4	354.25	379.75	444.66	25.87
PI-5	354.26	379.76	428.56	25.87
Commercial ink	141.9	262.1	358.6	0

Table S5 Effect of exposure energy on the cured layer thickness at exposure 3 s

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
E_0/mJ.cm^2	66.96	83.16	102.24	122.40	141.60	159.60	180.00	198.00	222.00	242.40	268.80	291.60	320.40	337.20	380.40
ln E_0	4.20	4.42	4.63	4.81	4.95	5.07	5.19	5.29	5.40	5.49	5.59	5.68	5.77	5.82	5.94
C_d/*mm*	0.20	0.22	0.27	0.30	0.33	0.34	0.36	0.38	0.40	0.41	0.42	0.44	0.45	0.47	0.48

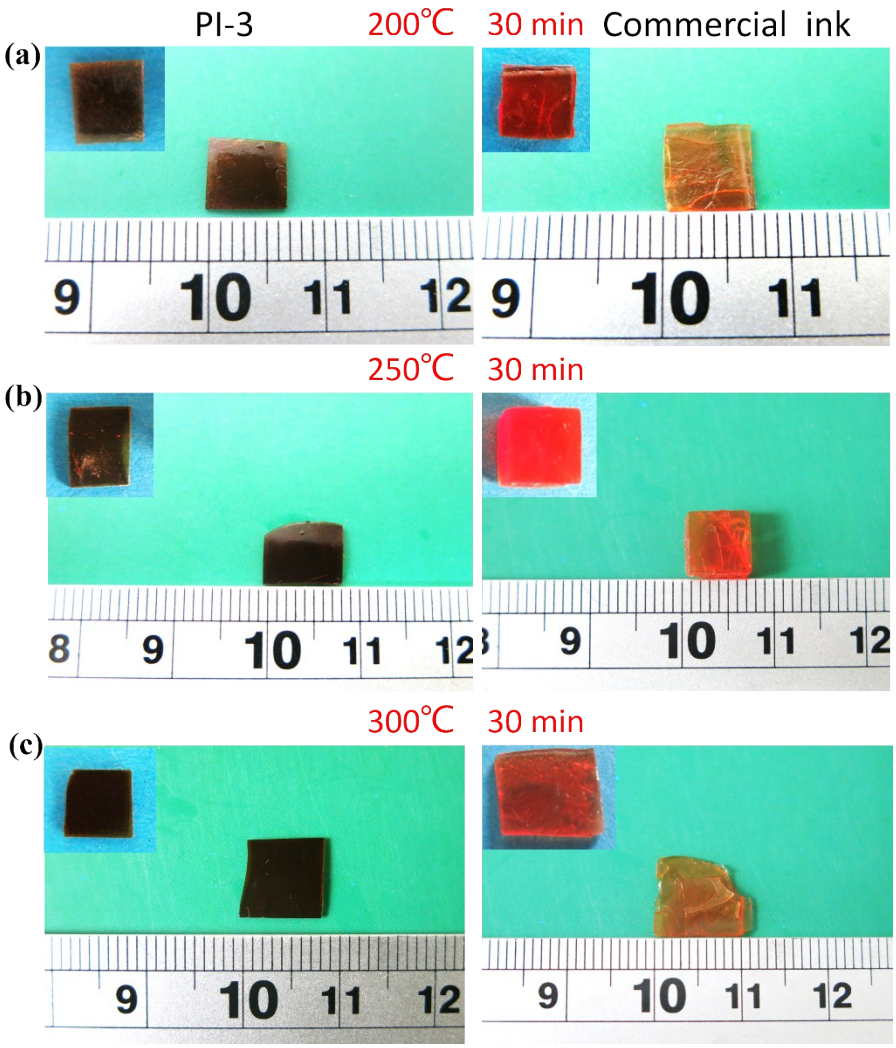

Fig. S4 The contrast of high temperature resistant oil performance between PI-3 ink and commercial ink at (a) 200 °C, 30 min, (b) 250 °C, 30 min and (c) 300 °C, 30 min.