Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Tough interpenetrating polymer network of silicone containing polyurethane and polystyrene with self-healing, shape memory and self-cleaning attributes

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Supporting Information Content

- 4 Pages (including the cover page)
- 3 Figures

Structural analysis

The structural evidence for the formation of IPNs was displayed by a comparative study of these starting materials (DAGP, PCL, PDMS, styrene and prepolymer of PS) through FT-IR spectra, as shown in Figure S1. Absorption band at 3100-3700 cm^{-1} corresponds to –OH stretching frequency and bands at 1720-1740 cm^{-1} confirmed the presence of carbonyl stretching frequency for the ester group of DAGP and PCL. Absorption bands at 1259, 1100, 1020 and 800 cm^{-1} correspond to the bending vibration of methyl group, asymmetric and symmetric stretching vibrations of Si-O-Si and Si-C stretching of PDMS moiety. The bands at 1690 and 3035-3085 cm^{-1} correspond to -HC=CH_2 and the benzylic C-H stretching frequencies of styrene monomer. The bands for benzylic C-H stretching (3035-3085 cm^{-1}), asymmetric and symmetric stretching vibrations of –C-H (2925-2856 cm^{-1}) along with the absence of band at 1690 cm^{-1} confirmed the conversion of styrene monomer into polystyrene. Combination of the above mentioned bands were also observed in the final structure of the IPNs. In addition, shifting of absorption bands from 1492 to 1497 and 1453 to 1464 cm^{-1} for the interaction of aromatic moiety (π-π interaction) of PS and PU was observed in the IPNs compared to the pristine individual polymers, as displayed in Figure S1(c).

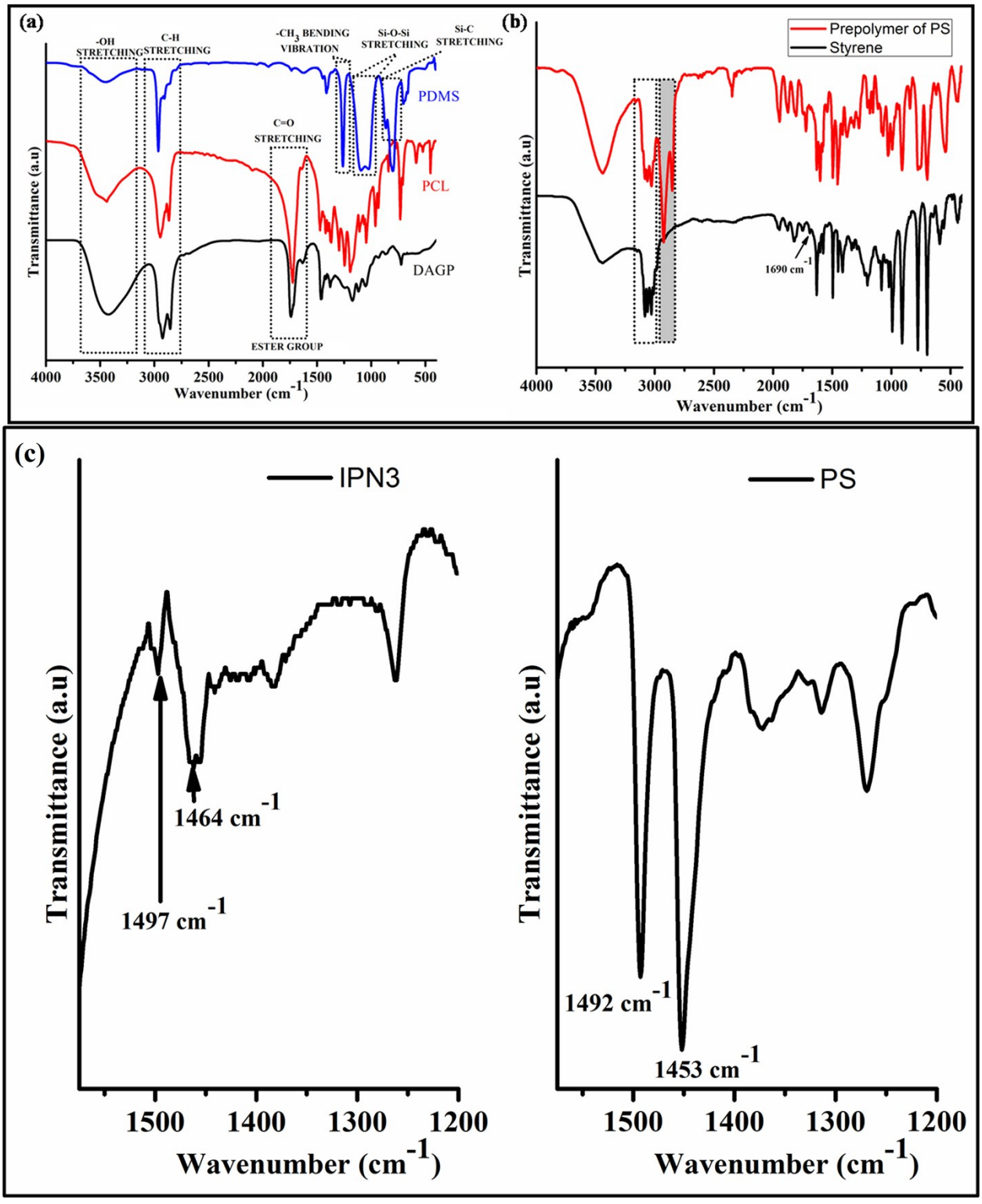

Figure S1. (a) FT-IR spectra of DAGP, PCL and PDMS (b) FT-IR spectra of styrene and pre-polymer of PS (c) FT-IR spectra of IPN3 and pre-polymer of PS in higher magnification.

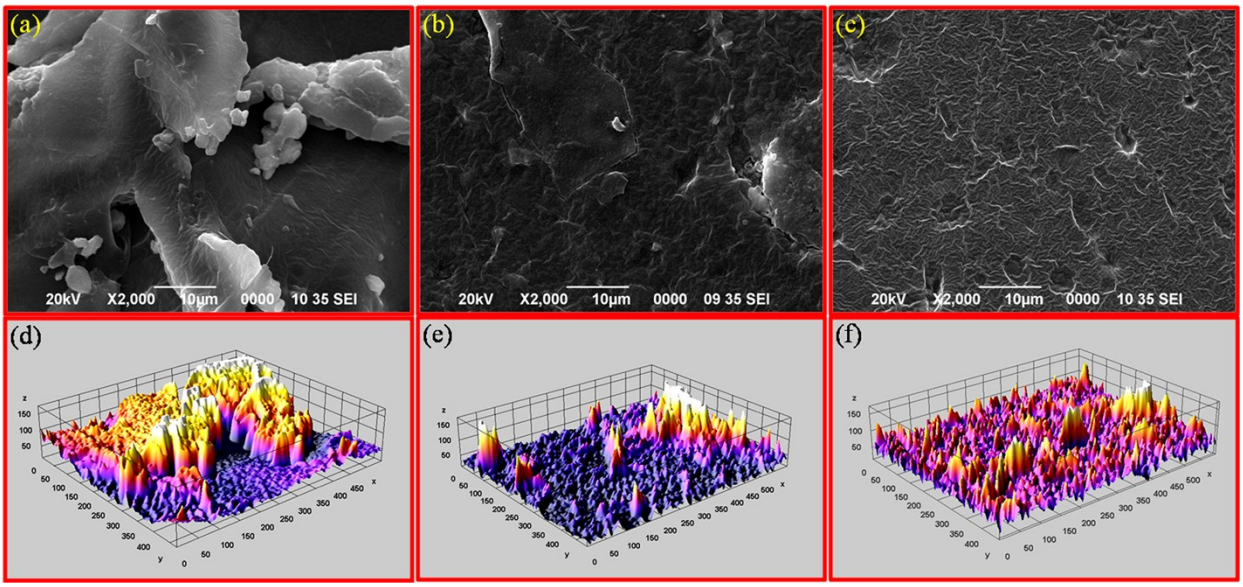

Figure S2. (a: IPN1, b: IPN2 and c: IPN3) SEM images of the rough surface and (d: IPN1, e: IPN2 and f: IPN3) 3D surface plot of the rough surface by image J2 software.

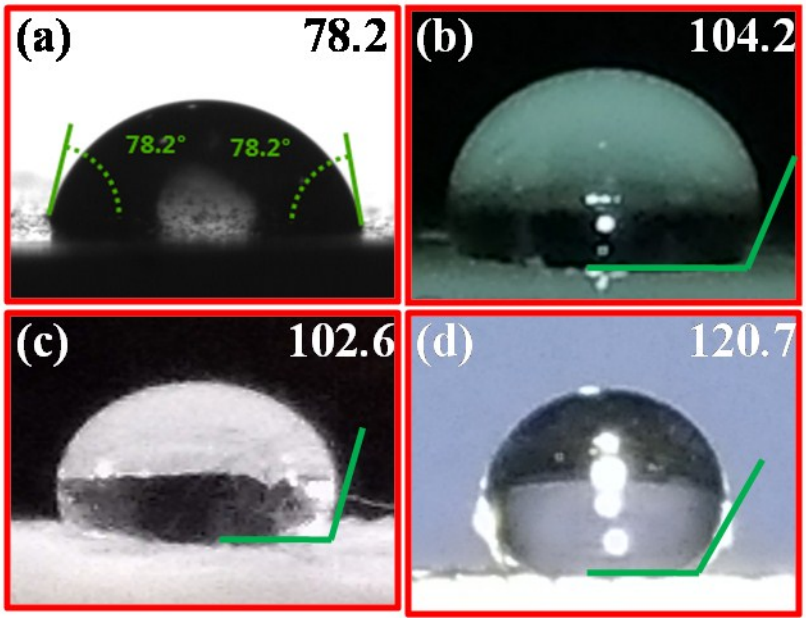

Figure S3. Digital images of water droplets on (a) PU without PDMS, (b) PU with PDMS (c) IPN without PDMS and (d) IPN with PDMS surfaces.