Science Advances
AAAS

advances.sciencemag.org/cgi/content/full/4/10/eaat7629/DC1

Supplementary Materials for

Optically transparent, high-toughness elastomer using a polyrotaxane cross-linker as a molecular pulley

Hiroaki Gotoh, Chang Liu, Abu Bin Imran, Mitsuo Hara, Takahiro Seki, Koichi Mayumi*, Kohzo Ito*, Yukikazu Takeoka*

*Corresponding author. Email: kmayumi@molle.k.u-tokyo.ac.jp (K.M.); kohzo@molle.k.u-tokyo.ac.jp (K.I.); ytakeoka@chembio.nagoya-u.ac.jp (Y.T.)

Published 12 October 2018, *Sci. Adv.* **4**, eaat7629 (2018)
DOI: 10.1126/sciadv.aat7629

This PDF file includes:

Table S1. Preparation of MEO_2MA elastomer with HPR-C with varying amounts of monomer-to-solvent ratio.
Table S2. Preparation of MEO_2MA elastomer with HPR-C with varying amounts of HPR-C concentration.
Table S3. Preparation of MEO_2MA elastomer with EGDMA with varying amounts of monomer to solvent ratio.
Scheme S1. Elastomer shapes used for the mechanical tests.
Fig. S1. Viscoelasticity dynamics of polyrotaxane cross-linked elastomers at various polyrotaxane concentrations.
Fig. S2. Stress-strain ratio curves of PR–cross-linked elastomer (PR concentration, 1 wt %) under loading-unloading process at various strain rates.
Fig. S3. Young’s moduli of elastomers with various HPR-C cross-linker concentrations.
Fig. S4. Photos of the HPR-C–cross-linked MEO_2MA elastomer exhibiting a reversible extensibility change.

Table S1. Preparation of MEO_2MA elastomer with HPR-C with varying amounts of monomer-to-solvent ratio.

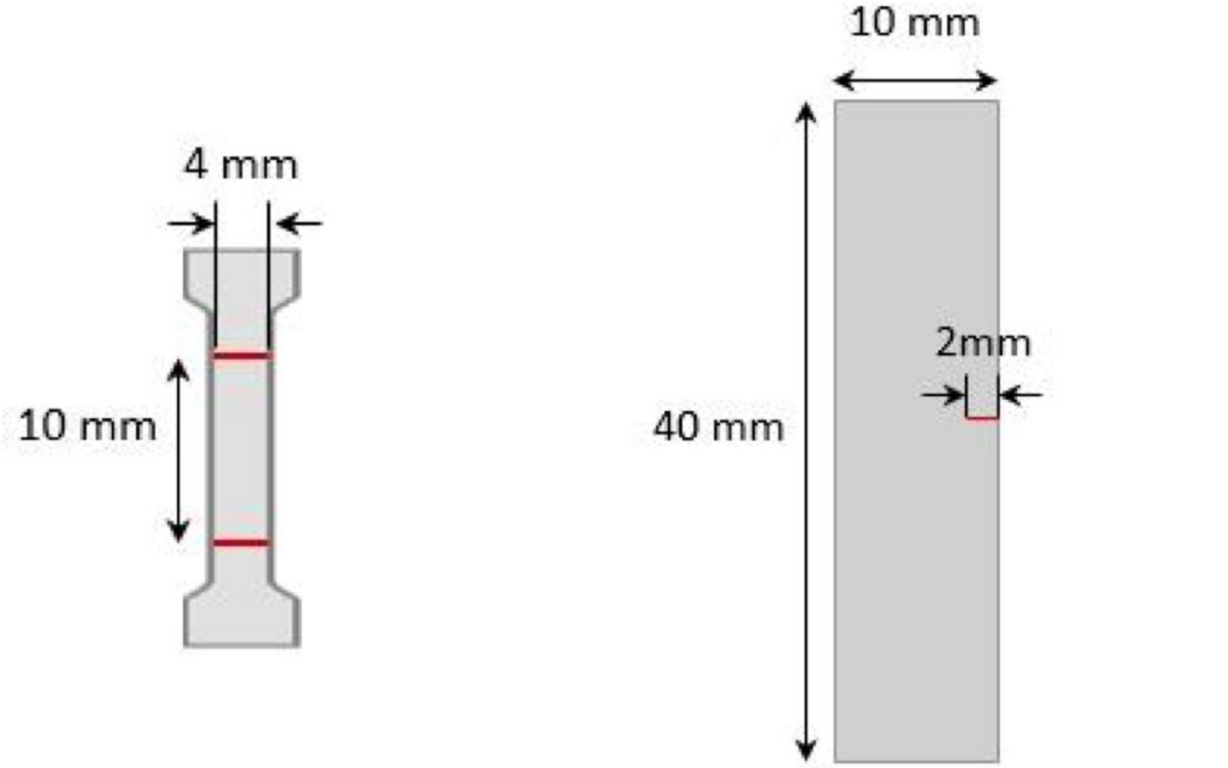
MEO_2MA [mL]	HPR-C (wt%)	AIBN [mg]	DMSO [mL]
1.0	1.0	1.34	0.5
1.0	1.0	1.34	1.0
1.0	1.0	1.34	1.5
1.0	1.0	1.34	2.0

Table S2. Preparation of MEO_2MA elastomer with HPR-C with varying amounts of HPR-C concentration.

MEO_2MA [mL]	HPR-C (wt%)	AIBN [mg]	DMSO [mL]
1.0	0.1	1.34	1.5
1.0	0.5	1.34	1.5
1.0	1.0	1.34	1.5
1.0	2.0	1.34	1.5
1.0	4.0	1.34	1.5
1.0	0.1	1.34	1.0
1.0	0.5	1.34	1.0
1.0	1.0	1.34	1.0
1.0	2.0	1.34	1.0
1.0	4.0	1.34	1.0

Table S3. Preparation of MEO_2MA elastomer with EGDMA with varying amounts of monomer to solvent ratio.

MEO_2MA [mL]	**EGDMA [mg]**	**AIBN [mg]**	**DMSO [mL]**
1.0	4.5	1.3	1.0
1.0	4.5	2.0	1.5
1.0	4.5	2.7	2.0
1.0	4.5	0.7	0.5
1.0	0.5	1.3	1.0
1.0	2.3	1.3	1.0
1.0	22.6	1.3	1.0



Dumbbell-shaped Single-edge-notched-tensile

(MEO_2MA + HPR-C or EGDMA, 1.0wt%)

Scheme S1. Elastomer shapes used for the mechanical tests.

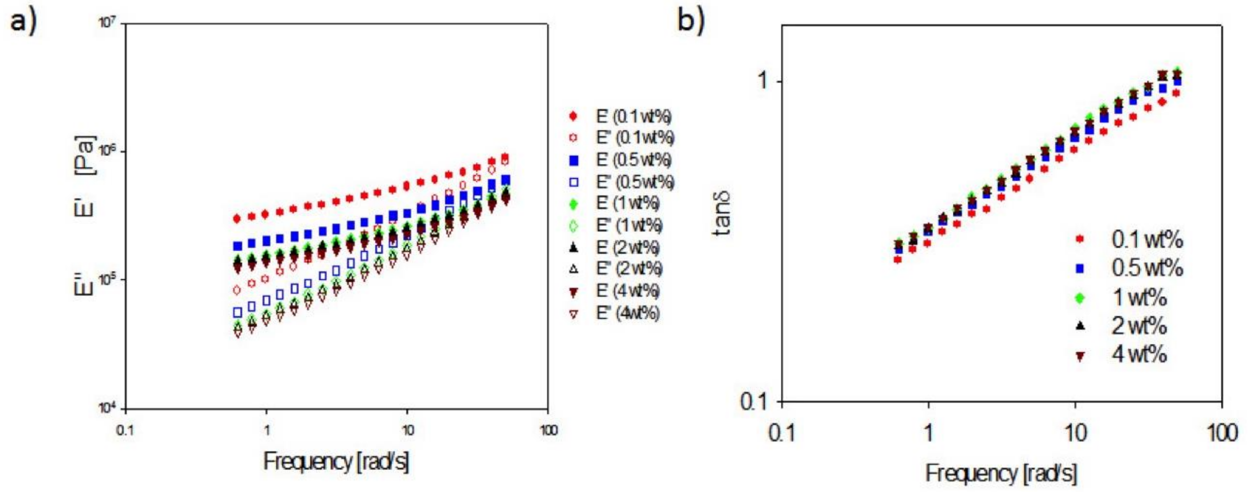


Fig. S1. Viscoelasticity dynamics of polyrotaxane cross-linked elastomers at various polyrotaxane concentrations. Dynamics viscoelasticity of polyrotaxane cross-linked elastomers with various polyrotaxane concentration from 0.1 to 4 wt%: a) frequency dependence of storage modulus *E*' and loss modulus *E*'', b) frequency dependence of tanδ.

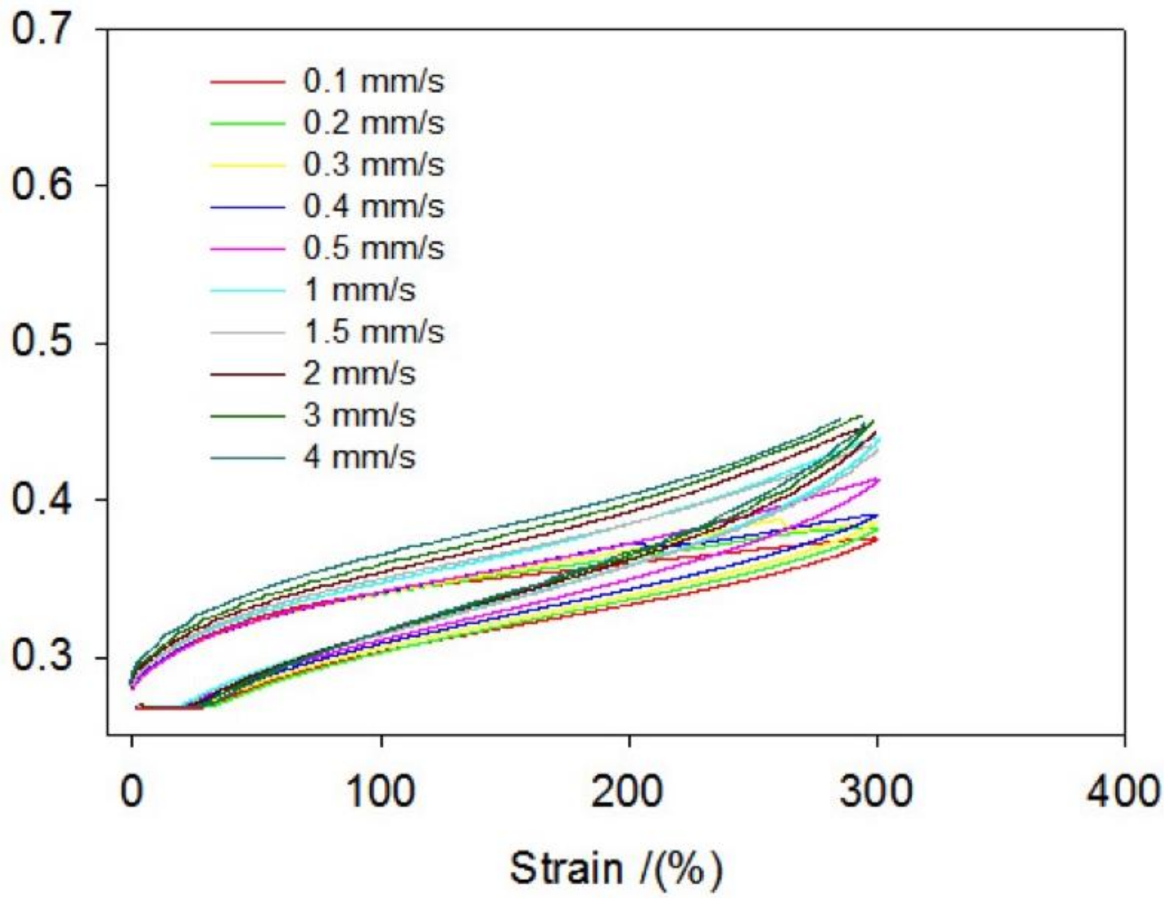


Fig. S2. Stress-strain curves of PR–cross-linked elastomer (PR concentration, 1 wt %) under loading-unloading process at various strain rates.

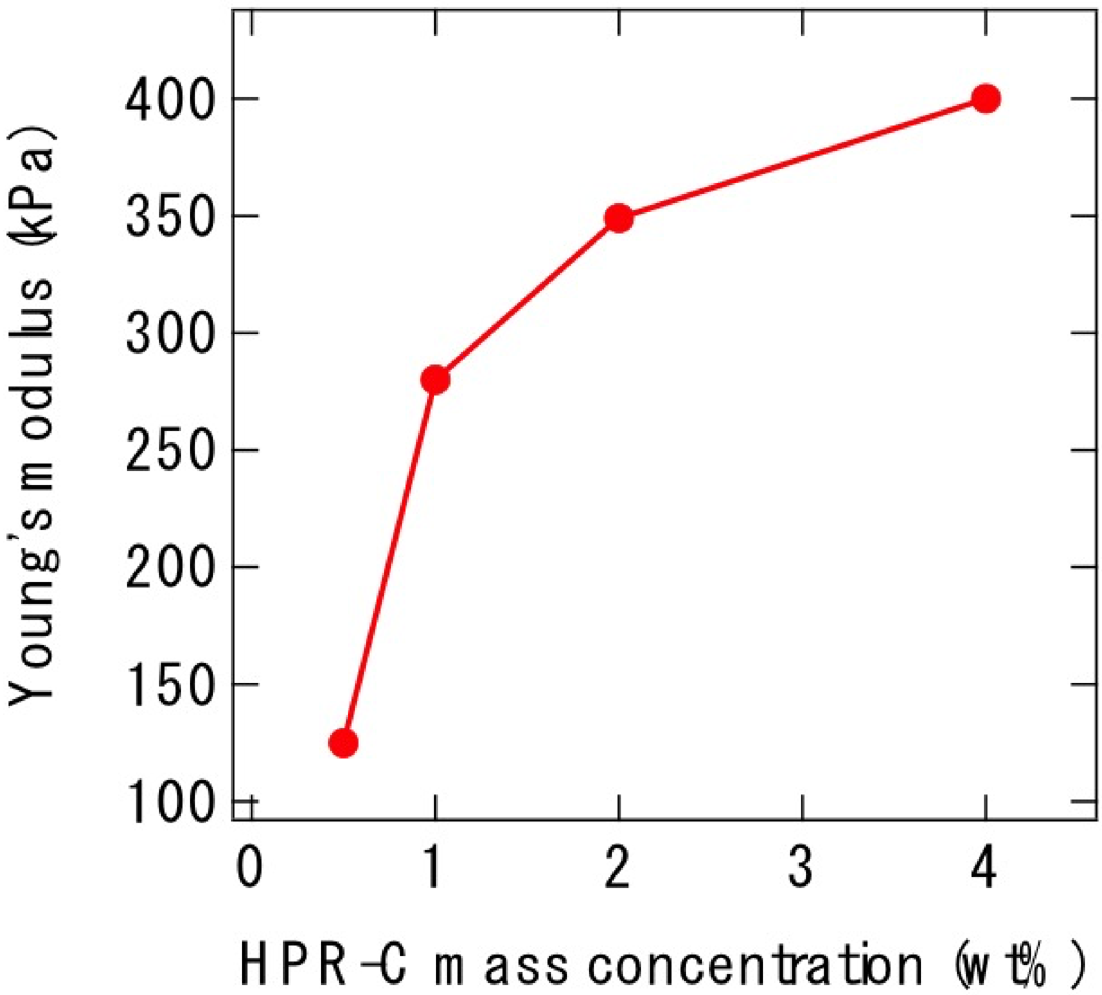


Fig. S3. Young's moduli of elastomers with various HPR-C cross-linker concentrations. For simplicity, we intentionally matched Young's moduli of HPR-C and EGDMA cross-linked elastomers to obtain networks with similar effective cross-linking density.

Statements are added to the manuscript to clarify our thoughts.

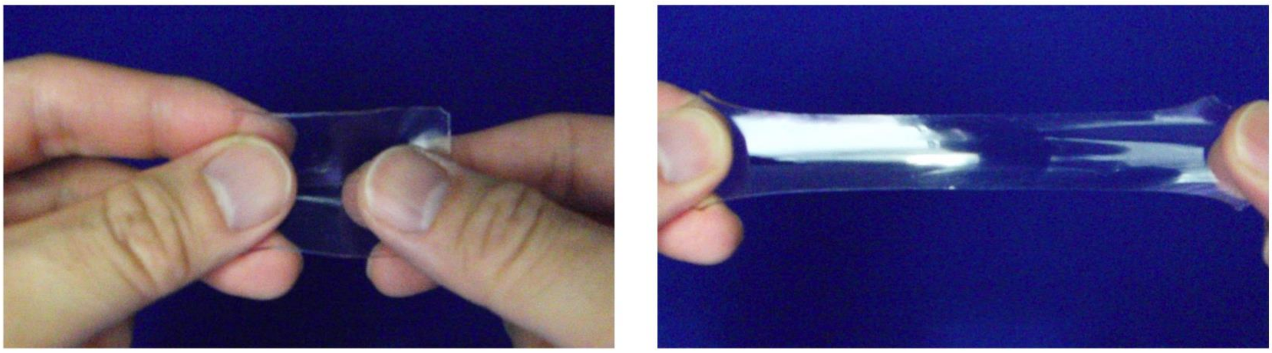


Fig. S4. Photos of the HPR-C–cross-linked MEO_2MA elastomer exhibiting a reversible extensibility change.