Supplementary Information

Automated Analysis of Soft Material Microindentation

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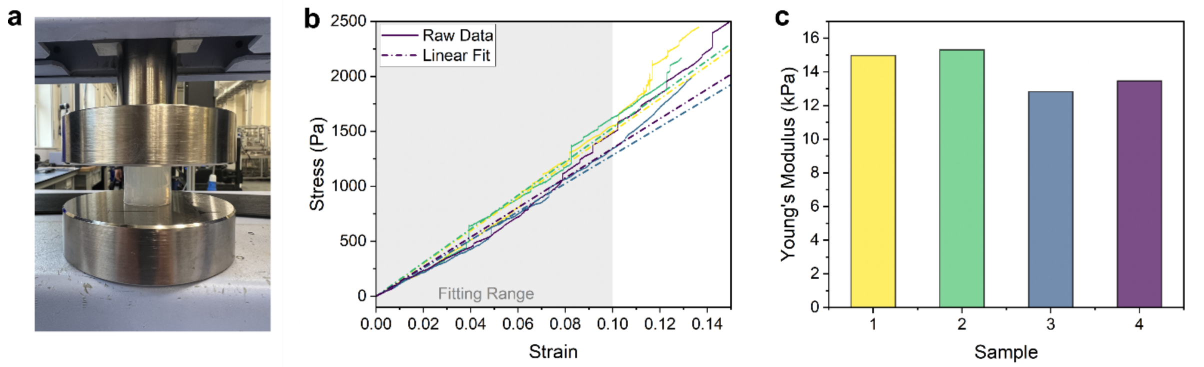
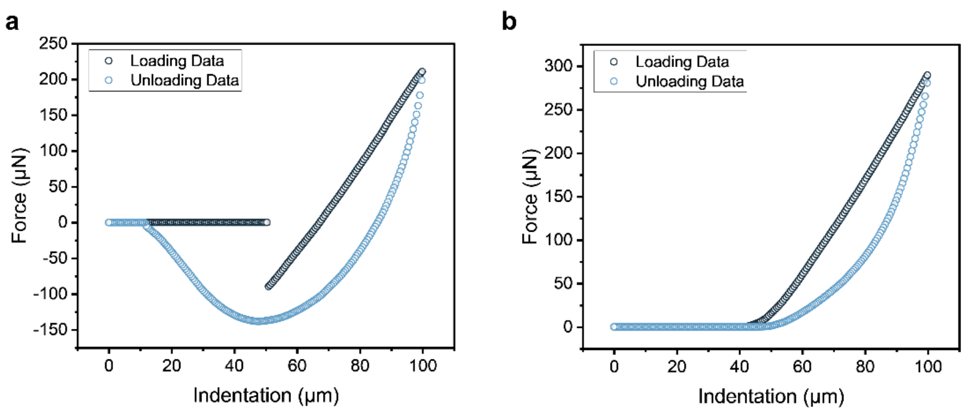
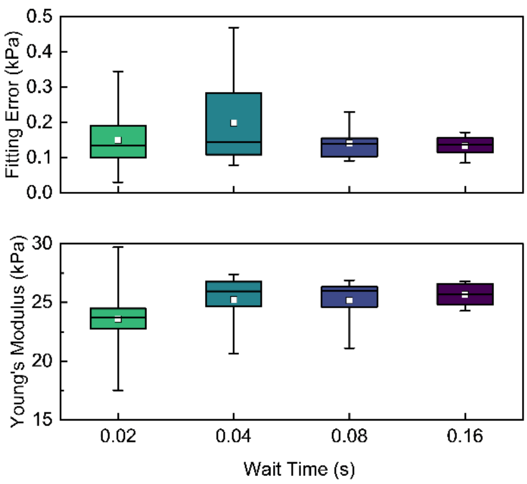


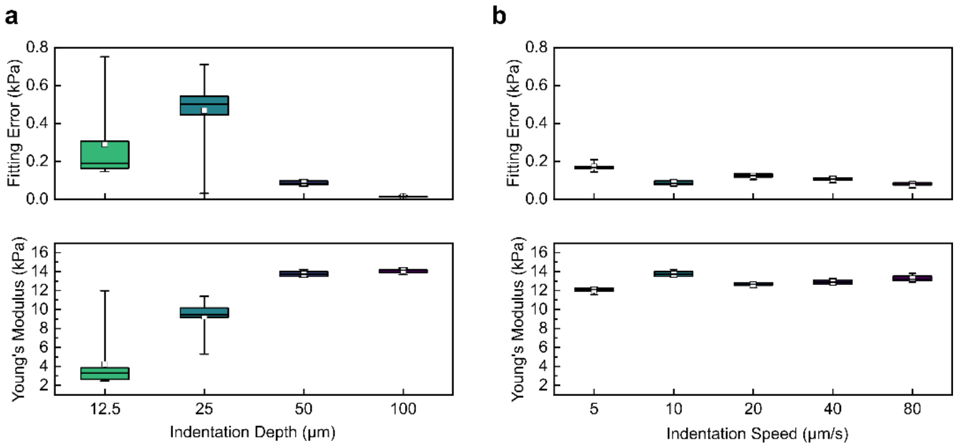
Supplementary Figure 1. Uniaxial compression testing of 7.5% polyacrylamide hydrogels. (a) Experimental setup and sample geometry, (b) linear fits of stress/strain data (to a maximum of 0.1 strain) for four hydrogel samples, and (c) resultant Young's moduli for each sample.



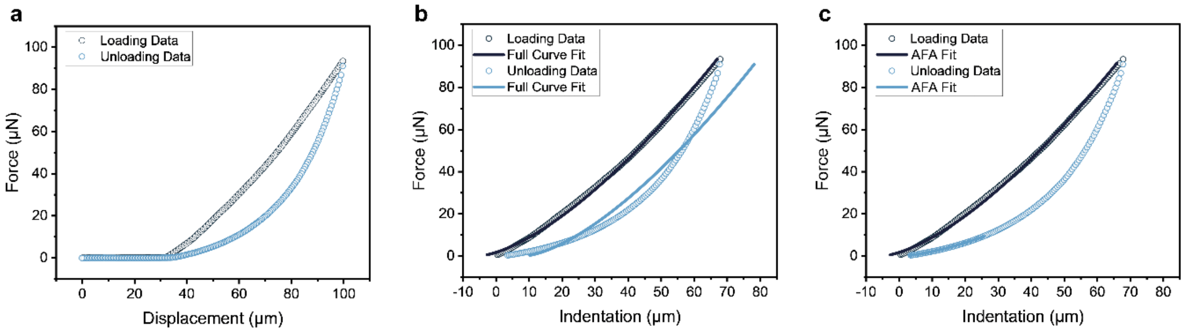
Supplementary Figure 2. Typical load-displacement curves obtained by the indentation of 2% agarose hydrogels in air (a), and with aqueous medium covering the sample (b).



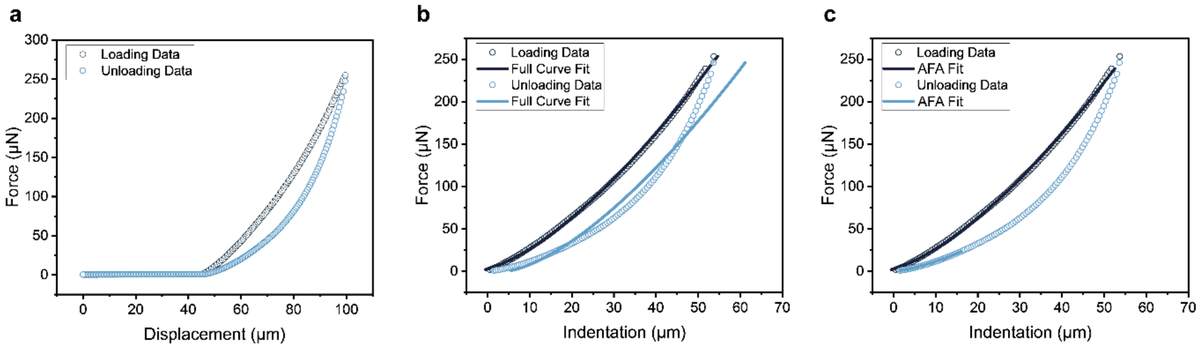
Supplementary Figure 3. Box charts showing Young's modulus values and associated fitting errors obtained by indenting 2% agarose hydrogels to a depth of approximately 50 µm at a speed of 10 µm s^{-1} with the stick-slip actuator whilst varying the wait time between actuation steps.



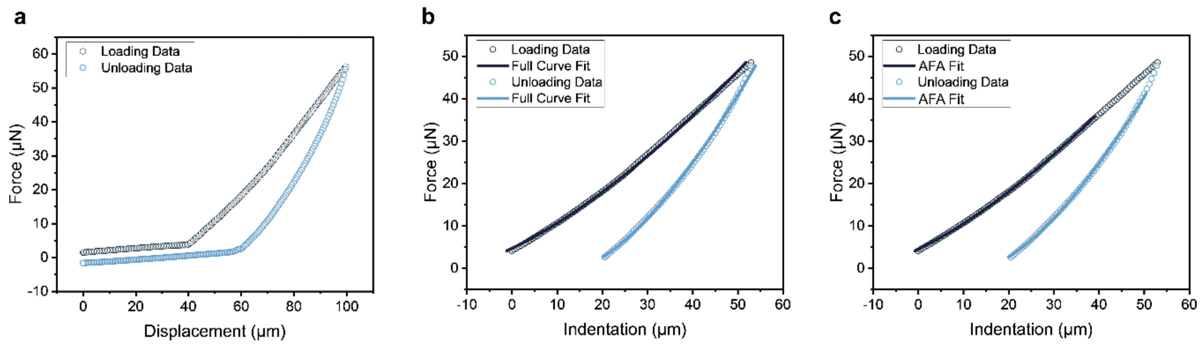
Supplementary Figure 4. Box charts showing Young's modulus values and associated fitting errors obtained by indenting 10% PEGDA hydrogels with a 300 µm diameter spherical probe. (a) Effects of altering indentation depth, and (b) effects of altering the indentation speed.



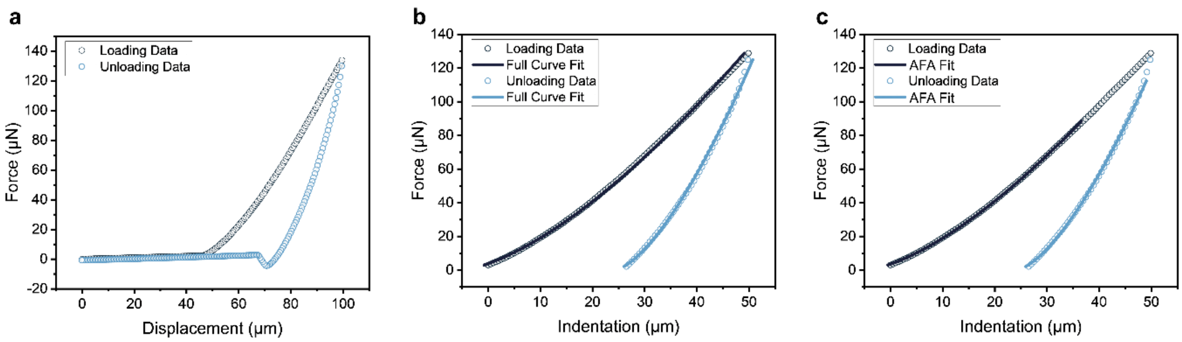
Supplementary Figure 5. Typical data obtained by indentation of 1% agarose hydrogels. (a) Raw force-displacement data, and processed data with (b) full curve fitting and (c) AFA fitting.



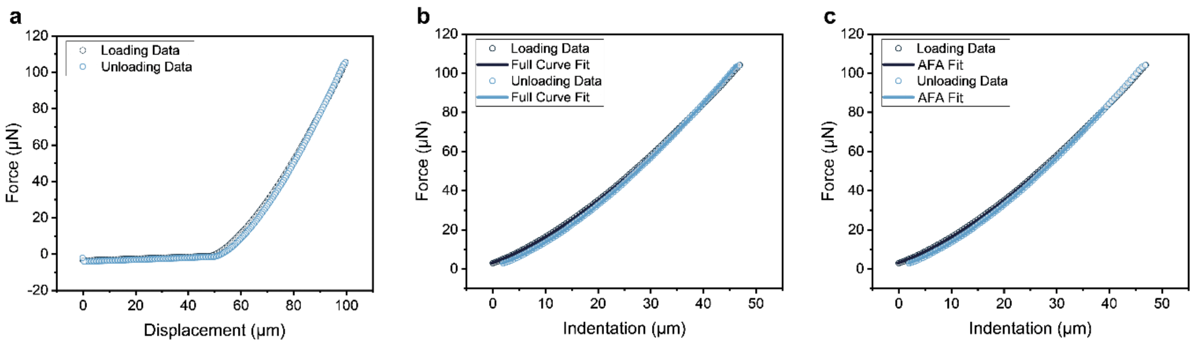
Supplementary Figure 6. Typical data obtained by indentation of 2% agarose hydrogels. (a) Raw force-displacement data, and processed data with (b) full curve fitting and (c) AFA fitting.



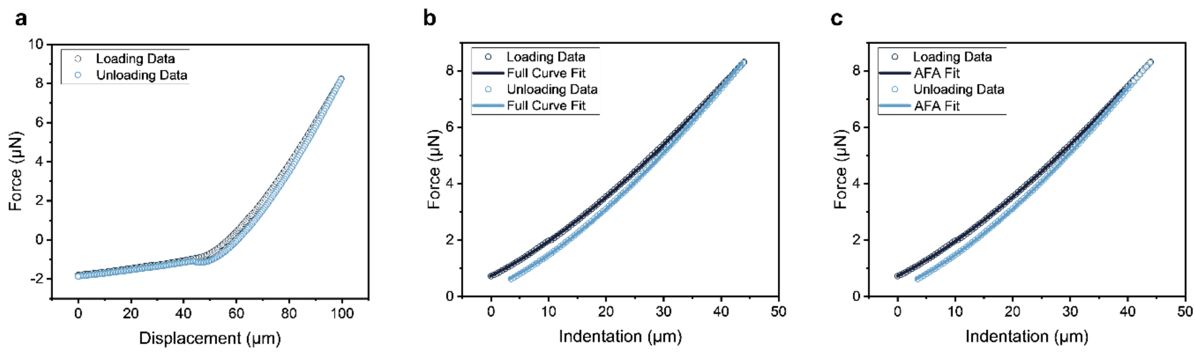
Supplementary Figure 7. Typical data obtained by indentation of 0.5% alginate hydrogels. (a) Raw force-displacement data, and processed data with (b) full curve fitting and (c) AFA fitting.



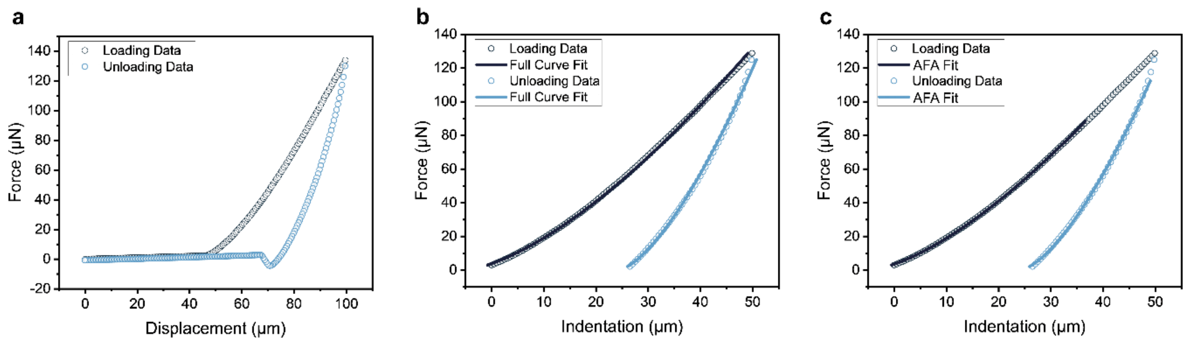
Supplementary Figure 8. Typical data obtained by indentation of 1% alginate hydrogels. (a) Raw force-displacement data, and processed data with (b) full curve fitting and (c) AFA fitting.



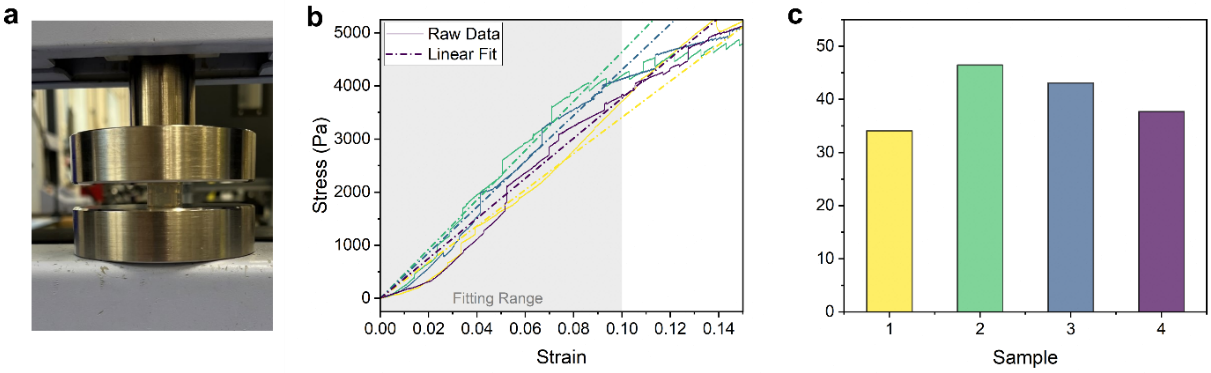
Supplementary Figure 9. Typical data obtained by indentation of 10% PEGDA hydrogels. (a) Raw force-displacement data, and processed data with (b) full curve fitting and (c) AFA fitting.



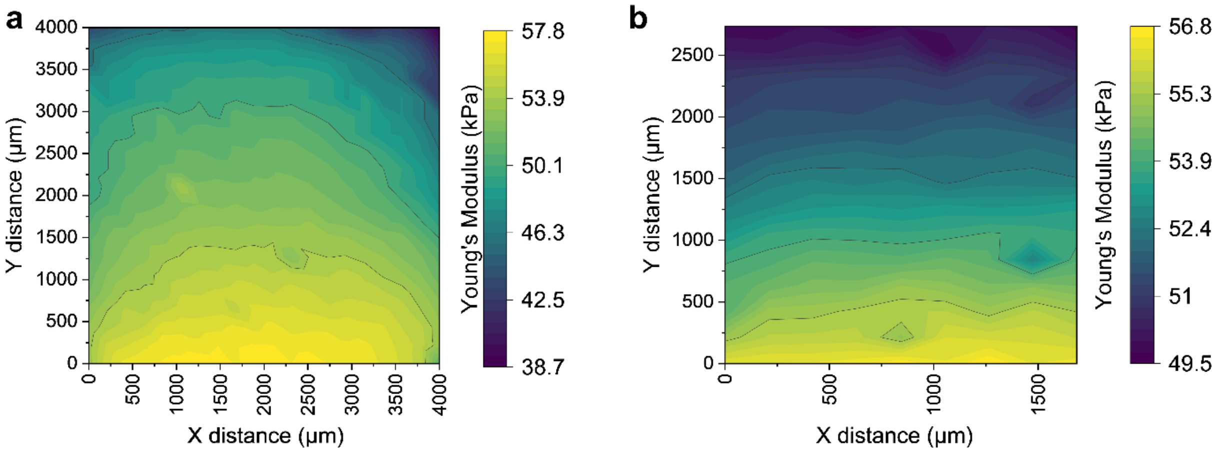
Supplementary Figure 10. Typical data obtained by indentation of 5% polyacrylamide hydrogels. (a) Raw force-displacement data, and processed data with (b) full curve fitting and (c) AFA fitting.



Supplementary Figure 11. Typical data obtained by indentation of 10% polyacrylamide hydrogels. (a) Raw force-displacement data, and processed data with (b) full curve fitting and (c) AFA fitting.



Supplementary Figure 22. Uniaxial compression testing of 2% w/v agarose hydrogels. (a) Experimental setup and sample geometry, (b) linear fits of stress/strain data (to a maximum of 0.1 strain) for four hydrogel samples, and (c) resultant Young's moduli for each sample.



Supplementary Figure 13. (a) Contour plot of a 20x20 array measurement of a PEGDA hydrogel irradiated through a gradient mask. (b) Contour plot of selected region of (a) displaying an approximately linear gradient in Young's modulus along the Y axis.

Supplementary Table 1. Reported modulus values included in the comparison in Figure 5.

Hydrogel	Concentration	Reported Modulus (kPa)	Method	Additional information	Reference
Agarose	1% w/w	39	Compression	Removed from liquid medium	Normand, 2000
Agarose	1% w/v	13.5	Macroscale indentation	4 mm sphere	Ahearne, 2005
Agarose	1%	10	Compression		Kock, 2013
Agarose	1%	3	Macroscale indentation	4.7 mm sphere, equilibrium	Strange, 2012
Agarose	1%	11	Macroscale indentation	4.7 mm sphere, instantaneous	Strange, 2012
Agarose	1% w/v	3.6	AFM indentation	5.3 µm sphere	Markert, 2013
Agarose	2%	16	Compression		Kock, 2013
Agarose	2%	19	Macroscale indentation	4.7 mm sphere, equilibrium	Strange, 2012
Agarose	2%	52	Macroscale indentation	4.7 mm sphere, instantaneous	Strange, 2012
Agarose	2% w/v	45	AFM indentation	4 µm sphere	Salerno, 2010
Agarose	2% w/v	10.6	AFM indentation	5.3 µm sphere	Markert, 2013
Agarose	2%	17	Compression		Buckley, 2009
Agarose	2% w/v	9.3	AFM indentation	5 µm sphere	Park, 2009
Agarose	2%	12	Compression		Mauck, 2000
Agarose	2%	63	Rheology		Aymard, 2001
Alginate	0.50%	3.6	AFM indentation	50 mM $CaCl_2$, 5.3 µm sphere	Markert, 2013
Alginate	0.50%	0.94	AFM indentation	48 mM $CaCO_3$, 96 mM GDL	Candiello, 2013
Alginate	0.50%	6.3	Compression	Saturated Ca	Dalheim, 2019

Alginate	0.50%	1	Rheology	22 mM $CaCl_2$	McKay, 2014
Alginate	1%	6	AFM indentation	50 mM $CaCl_2$, 5.3 μm sphere	Markert, 2013
Alginate	1%	20	Rheology	50 mM $CaCl_2$	Banerjee, 2009
Alginate	1%	31.4	Compression	Saturated Ca	Dalheim, 2019
Alginate	1%	3.8	Compression	Saturated Ca	Aarstad, 2017
Alginate	1%	11.5	Compression	Saturated Ca	Aarstad, 2017
Alginate	1%	32.3	Compression	Saturated Ca	Aarstad, 2017
PEGDA	10% w/v	1.1	AFM indentation	Mw: 3.4 kDa	Markert, 2013
PEGDA	10% w/v	64.4	Compression	Mw: 3.4 kDa	Lin, 2011
PEGDA	10% w	70	Compression	Mw: 8 kDa	Parlato, 2014
PEGDA	10% w/v	59.2	Tensile	Mw: 3.4 kDa	Lin, 2011
PEGDA	10%	30	Compression	Mw: 10 kDa	Liao, 2008
PEGDA	10% w/v	8	AFM indentation	Mw: 20 kDa	Nemir, 2010
PEGDA	10%	44.6	AFM indentation	Mw: 575 Da	Corbin, 2012
PEGDMA	11% w/v	9.5	Rheology	Mw: 750 Da	Kolewe, 2019
Polyacrylamide	5.2% w/v	6.5	Tensile	2.91% w/w crosslinker	Engler, 2004
Polyacrylamide	5.2% w/v	5.8	AFM indentation	2.91% w/w crosslinker	Engler, 2004
Polyacrylamide	5.2% w/v	1.3	AFM indentation	3.33% w/w crosslinker	Markert, 2013
Polyacrylamide	5.2% w/v	4.47	AFM indentation	2.91% w/w crosslinker	Tse, 2010

Polyacrylamide	4% w/w	0.6	Microfluidic testing	2.6% w/w crosslinker	Wyss, 2010
Polyacrylamide	6% w/w	3.4	Microfluidic testing	2.6% w/w crosslinker	Wyss, 2010
Polyacrylamide	10% w/w	105	Microfluidic testing	2.6% w/w crosslinker	Wyss, 2010
Polyacrylamide	10.3% w/v	41.82	Macroscale indentation	2.93% w/w crosslinker	Ambrosi, 2009
Polyacrylamide	10.3% w/v	32	AFM indentation	2.91% w/w crosslinker	Wen, 2014
Polyacrylamide	10.3% w/v	2.2	AFM indentation	3.33% w/w crosslinker	Markert, 2013
Polyacrylamide	10.3% w/v	50	Micro indentation	2.91% w/w crosslinker, 30-50 μm spheres	Hazeltine, 2012
Polyacrylamide	10.6% w/v	23.43	AFM indentation	2.20% w/w crosslinker	Tse, 2010