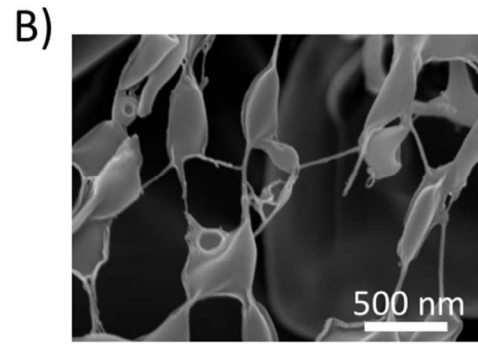
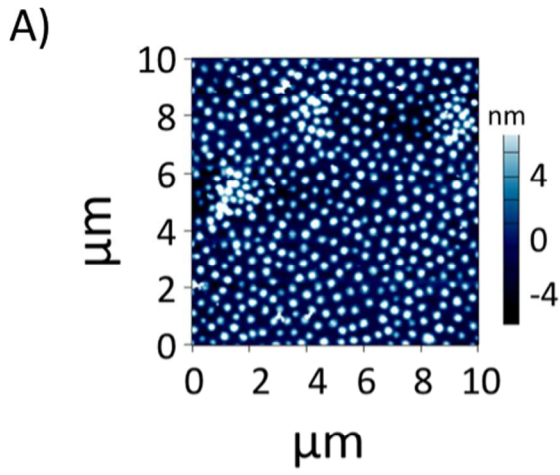


Figure S1: Particle size distributions were determined using nanoparticle tracking analysis. All particles display Gaussian size distributions.



C)

Diameter	618.7 ± 34.6 nm
Height	9.97 ± 1.40 nm
Spread Area	0.055 ± 0.018 μm^2
Volume	$.0005 \pm .0001$ μm^3

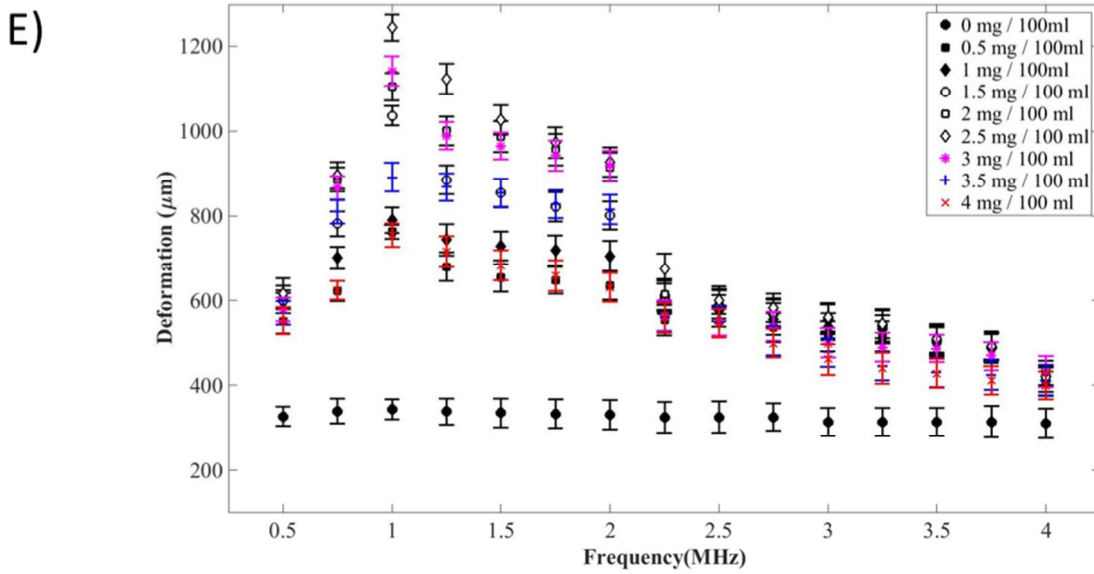
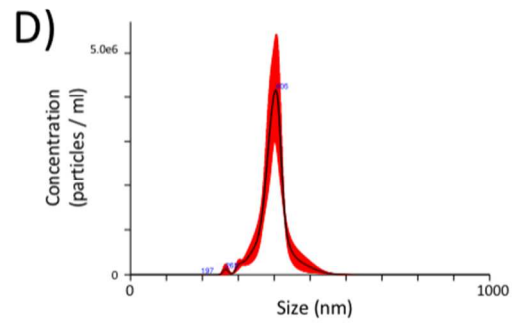
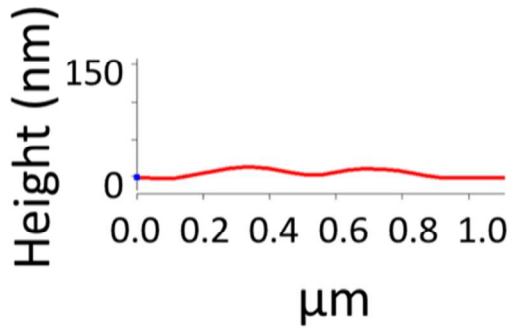


Figure S2: 1% BIS microgels were synthesized in the same manner as the 0, 2, 4, and 7% crosslinked microgels and then characterized using AFM **(a)**, CryoSEM **(b)**, and DLS. Microgels were then embedded in a tissue-mimicking phantom at various concentrations and subjected to ultrasound stimulation in the form of continuous sine wave insonification at frequencies ranging from 0.5 to 4.0 MHz. Deformation was tracked using high-frame-rate stroboscopic imaging, as in the cases of 0, 2, 4, and 7% microgels. **(a)** AFM dry imaging of 1% BIS microgels deposited on a glass coverslip. A minimum of 30 particles were analyzed, and the heights and volumes obtained are displayed in (C). **(b)** CryoSEM imaging of 1% BIS microgels taken at 50000X magnification. **(c)** Size and deformability characterization of 1% BIS microgels obtained via dynamic light scattering of microgels in 10 mM formate buffer, pH 3.0 (diameter) and AFM dry imaging (height, spread area, and volume). **(d)** Size distribution of 1% BIS microgels, obtained via nanoparticle tracking analysis. Microgel size distribution is Gaussian; microgel diameter in 10 mM formate buffer was determined to be 399 ± 39 nm. **(e)** Magnitude of deformation of 1% microgels embedded in a tissue-mimicking phantom obtained at each concentration and frequency. 1% BIS microgels follow the trends displayed by all other microgel crosslinking densities.