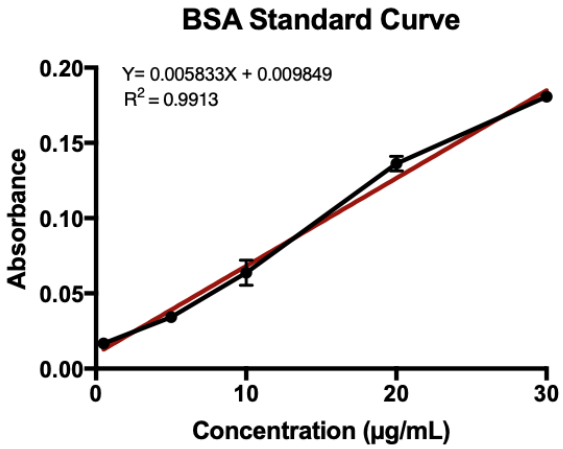
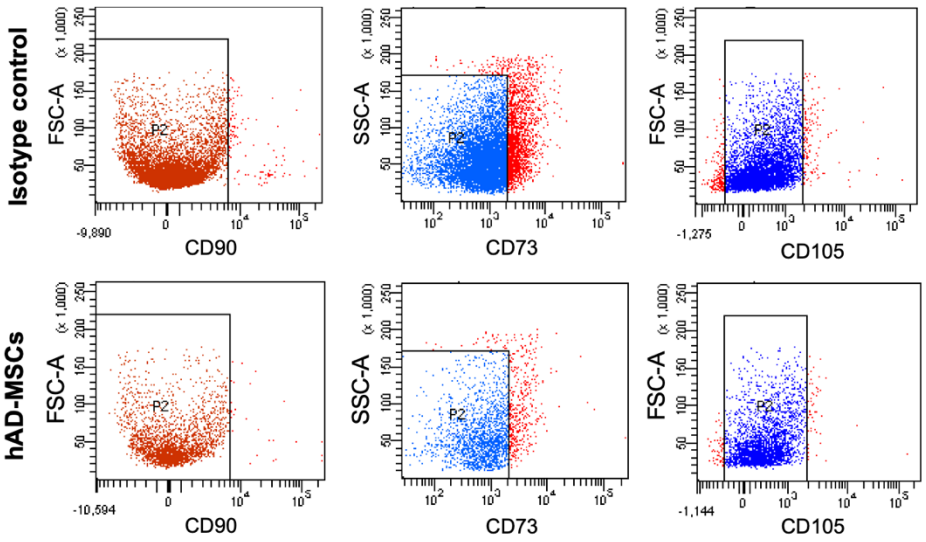
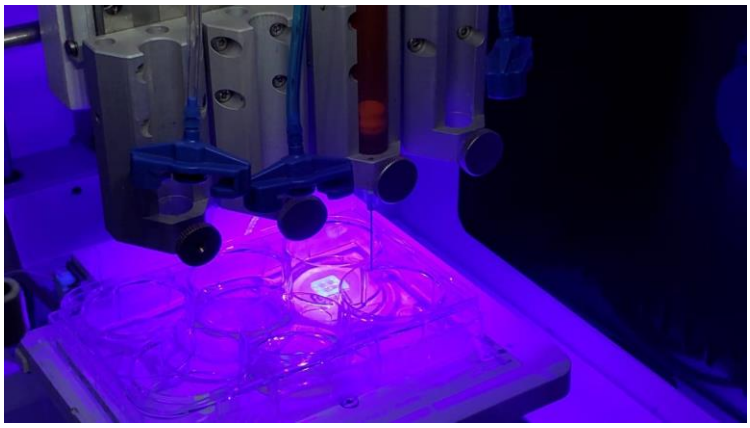
Supplementary Files



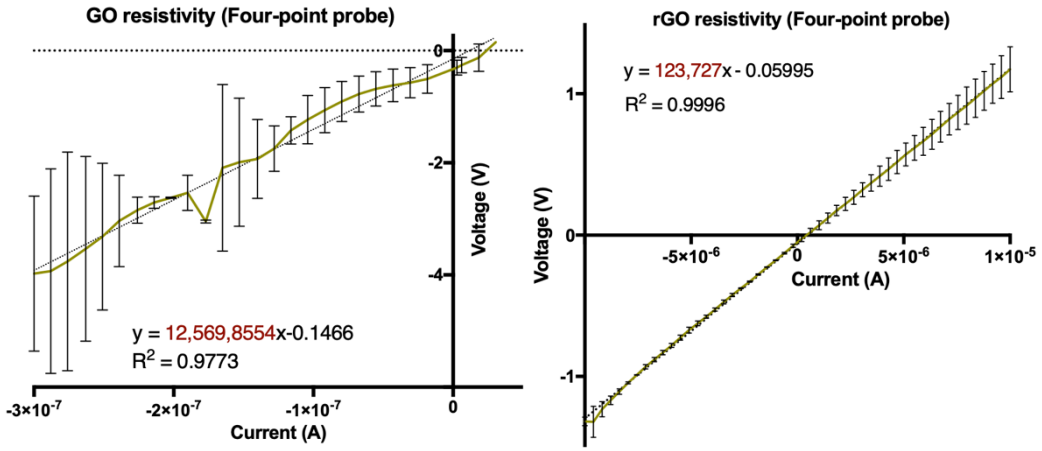
Supplementary Figure 1. Standard curve for BCA assay. Bovine serum albumin at different known concentrations was used as standard to predict the protein concentration in DMEM before and after exposure to GO nanosheets.



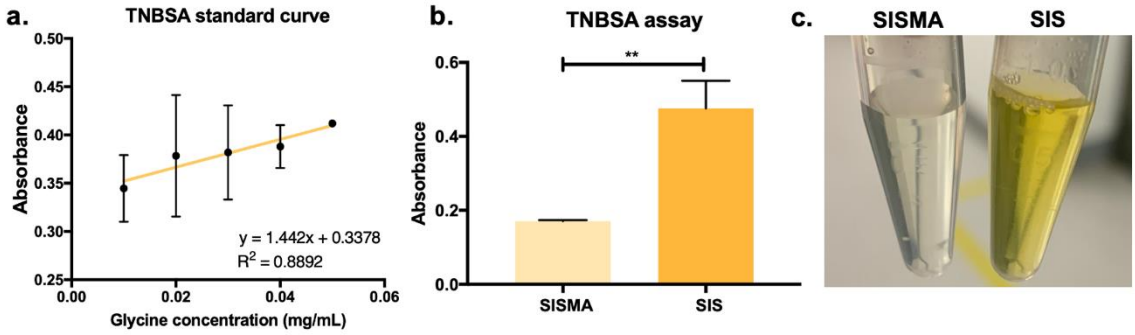
Supplementary Figure 2. hAD-MSCs markers profile. Isolated hAD-MSCs were labeled for three positive stem cell markers (i.e CD90, CD73 and CD105) and compared with the isotype control of the human mesenchymal stem cell validation kit. The obtained population profiles after staining for each marker resembled the isotype control, confirming their mesenchymal stem cell profile.



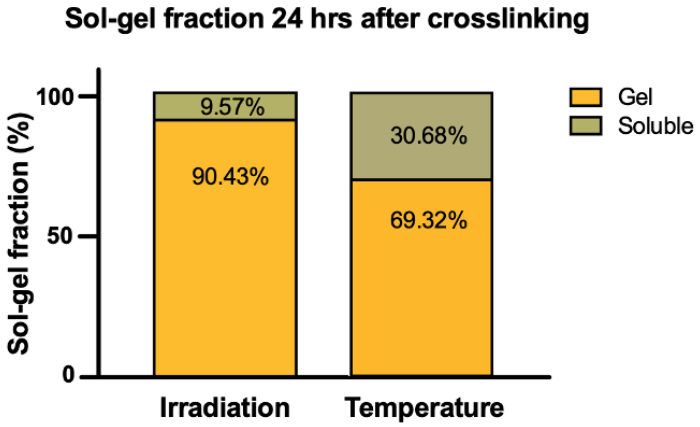
Supplementary Figure 3. Bioprinting setup for SISMA-GO bioinks. SISMA-GO irradiation setup upon deposition in 6-well plates. The blue-light (405 nm) module was set 3 cm above the construct and was used to irradiate for 1 min. A grid-like shape was selected to confirm shape fidelity and printability.



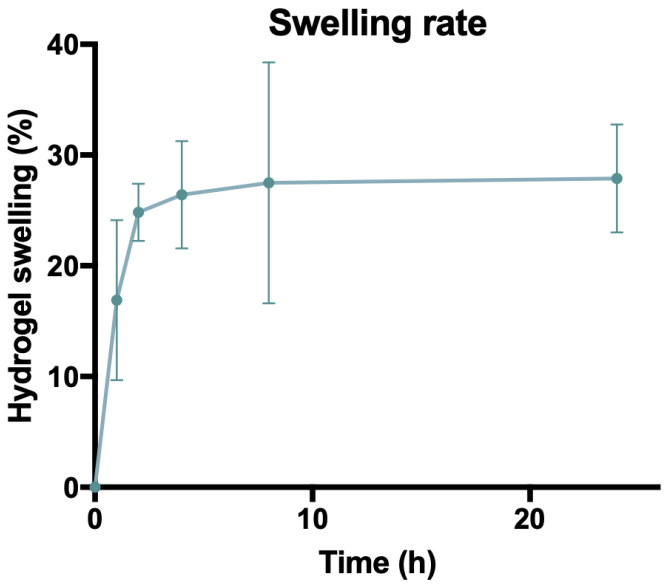
Supplementary Figure 4. Current vs voltage profiles measured with the four-point probe method. The resistivity of GO and reduced GO nanosheets measured by assessing their current-voltage profiles and fitting a linear regression model. By Ohm's Law, their resistivity corresponds to the slope of this regression (in Ohms). This value was used to determine their respective electrical conductivity.



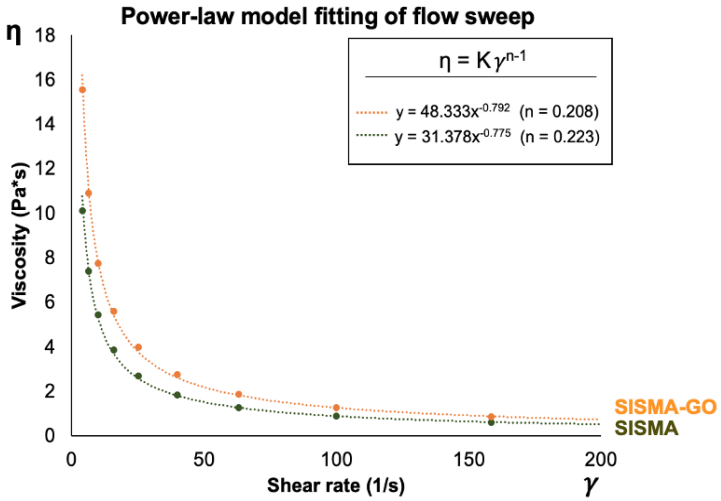
Supplementary Figure 5. TNBSA assay. (a) Glycine standard curve for predicting the molar concentration of free amines in SIS hydrogels and calculating the required reactants for its methacryloyl-modification. (b) Absorbance difference between SIS and SISMA samples indicates a statistically significant reduction in free amines upon methacryloyl-modification. (c) Observable colorimetric difference between SISMA and SIS samples after reacting with TNBSA. Color intensity indicates greater presence of free-amines in the sample.



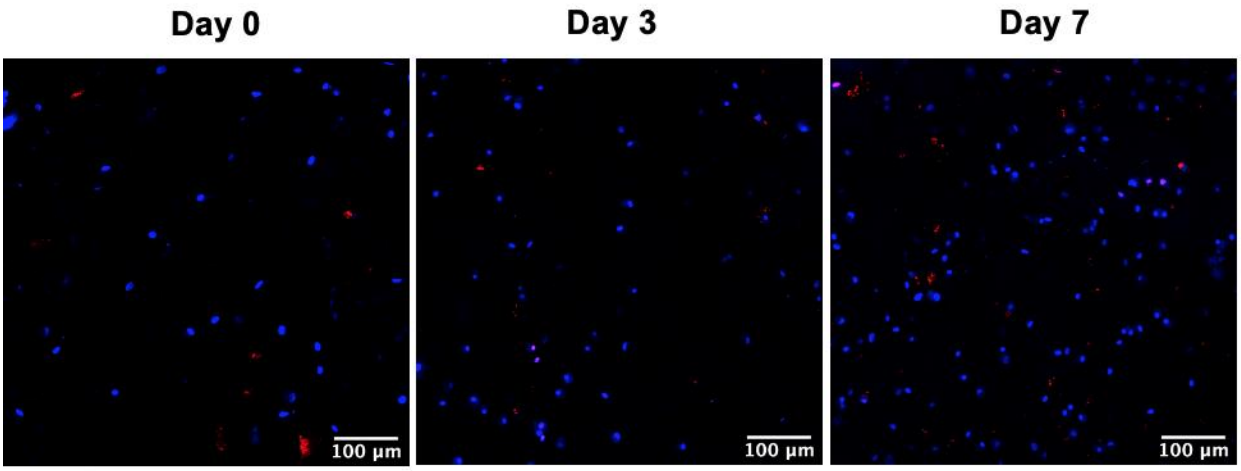
Supplementary Figure 6. Sol-gel fraction upon crosslinking. Determination of gel and soluble fraction of SISMA hydrogels crosslinked with blue-light irradiation and temperature after 24 hrs. Gel fraction refers to the percentage of the original weight that remains crosslinked after this time period and soluble fraction to the percentage that was lost.



Supplementary Figure 7. Swelling profile of photo-crosslinked SISMA-GO constructs. Three identical SISMA-GO constructs were bioprinted and crosslinked with 1 min of blue-light irradiation. Their initial weight was recorded, and these were subsequently incubated in regular cell culture media. Their weight was sequentially recorded at 1-, 2-, 4-, 8- and 24-hour time points after bioprinting by removing the culture media and carefully removing excess media by surface blotting.



Supplementary Figure 8. Flow sweep power-law model fitting. Flow sweep profiles of SISMA and SISMA-GO were fitted to a power-law regression model to find the associated *n* coefficient, which is indicative of their shear-thinning behavior. *n* values near 0.2 indicate strong shear-thinning.



Supplementary Figure 9. Fluorescent staining of live and dead cells. hAD-MSCs embedded in SISMA-GO constructs were exposed to Hoechst 3342 (blue) and propidium iodide (red) dyes 2 hours, 3 days and 7 days after bioprinting to stain cell nuclei and dead cells, respectively. Live cells were identified as those that only emitted blue signals and dead cells as those that emitted both blue and red signals (seen as magenta).