Electronic Supplementary Material (ESI) for Soft Matter.

Supporting Information

Fabrication of Heterogeneous Chemical Patterns on Stretchable Hydrogels Using Single-Photon Lithography

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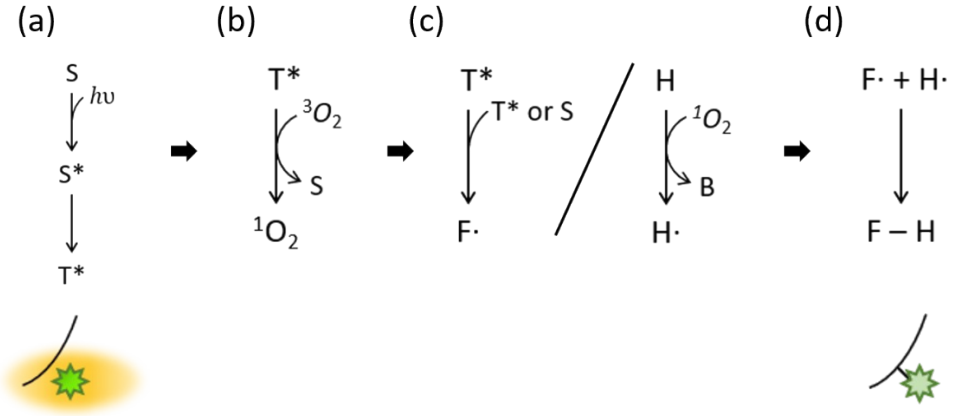

Fig. S1 Schematic illustration of the chemical reaction of fluorescein and the hydrogel backbone. (a) Formation of triplet-excited state fluorescein. (b) Formation of singlet oxygen. (c) Formation of fluorescein radical species and hydrogel radical species. (d) Chemical linkage between fluorescein and the hydrogel backbone. S: ground state fluorescein; S*: singlet-excited state fluorescein; T*: triplet-excited state fluorescein; F·: fluorescein radical species; H·: hydrogel radical species; B: by-product.

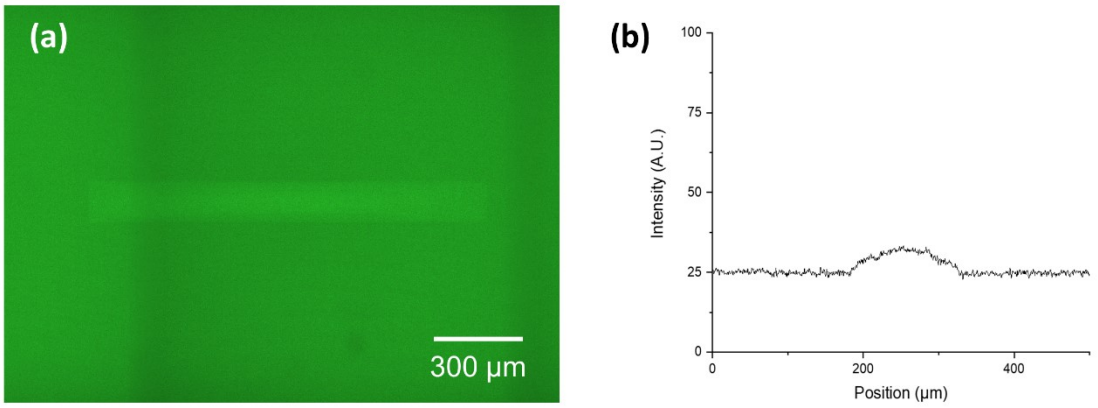

Fig. S2 Fluorescence image of photobleached fluorescein on the PAAm hydrogel after patterning. (a) Image obtained from patterning using 405 nm laser for exposure. (b) Intensity profiles of (a).

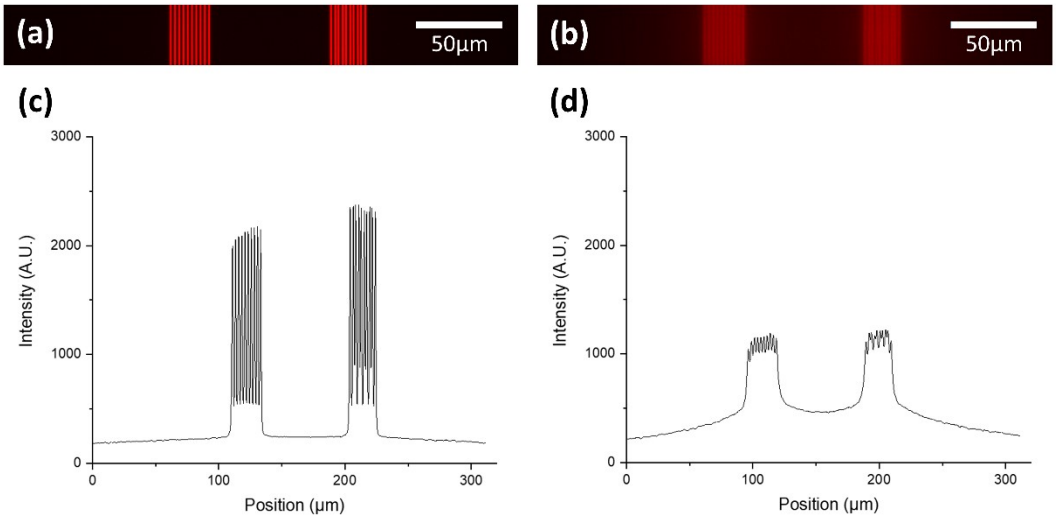

Fig. S3 Fluorescence images of patterning using 5-aminoFITC as incubation solution on the PAAm hydrogel with different laser wavelengths. (a) Image obtained from patterning using 405 nm laser for exposure. (b) Image obtained from patterning using 488 nm laser for exposure. (c) Intensity profiles of (a). (d) Intensity profiles of (b).

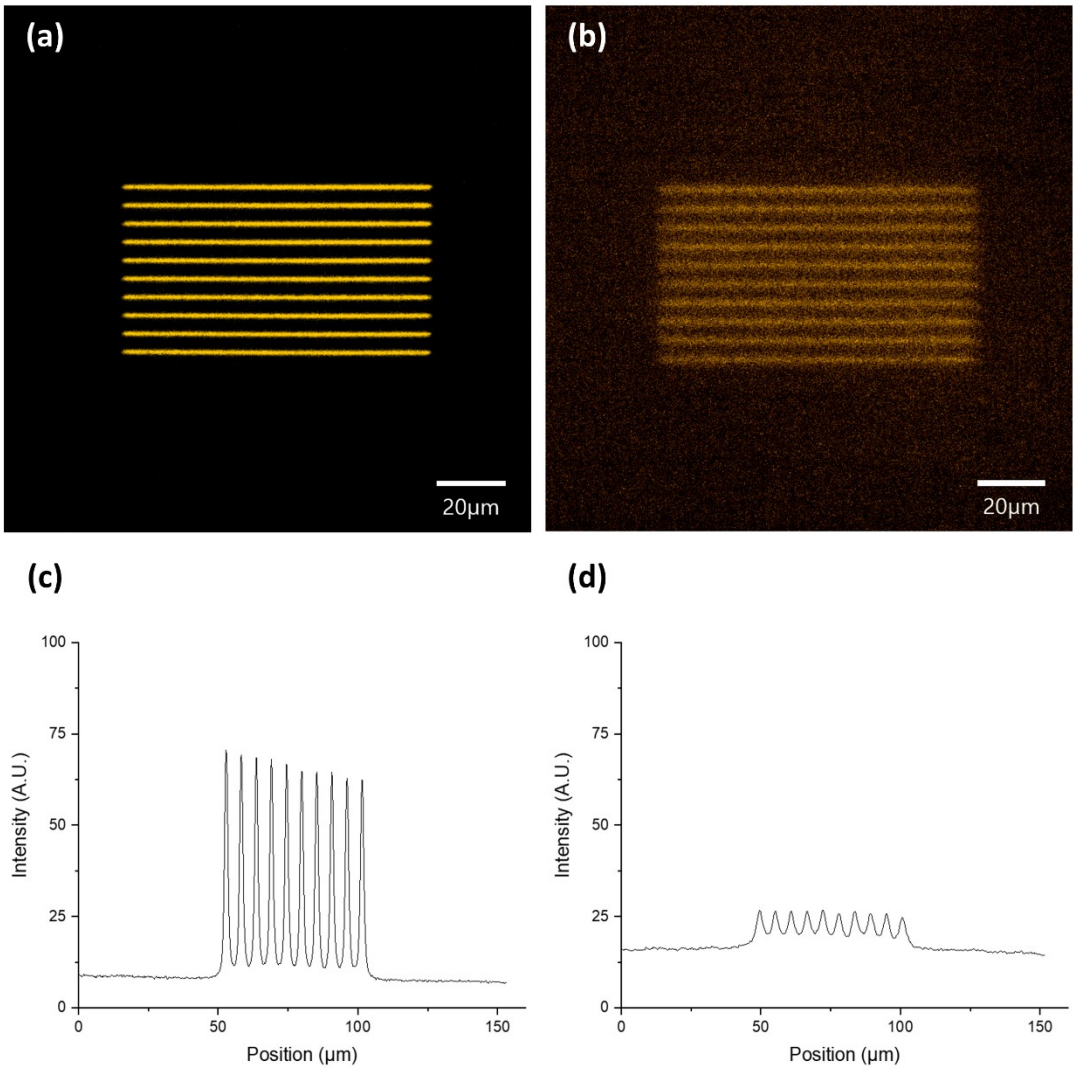

Fig. S4 Fluorescence images of patterning on the PAAm-sodium acrylate hydrogel with different incubation solutions. (a) Image obtained from patterning using CF-633 NHS ester as incubation solution and 640 nm laser for exposure. (b) Image obtained from patterning using Alexa Fluor 546 carboxylic acid, succinimidyl ester as incubation solution and 561 nm laser for exposure. (c) Intensity profiles of (a). (d) Intensity profiles of (b).

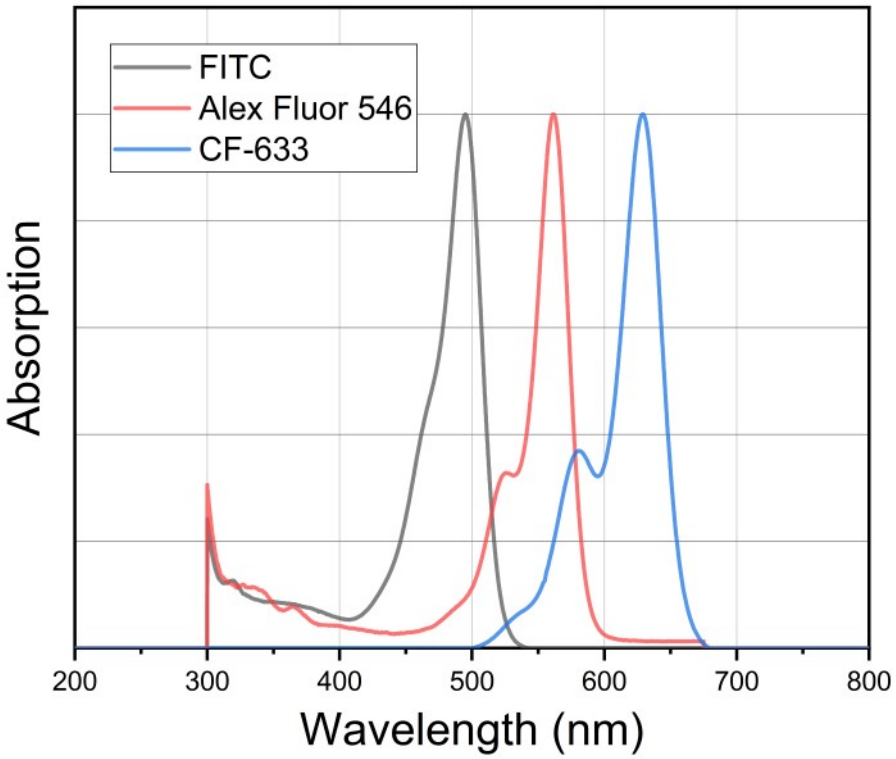

Fig. S5 Absorbance spectra of the fluorophores used: FITC, Alexa Fluor 546, CF-633.

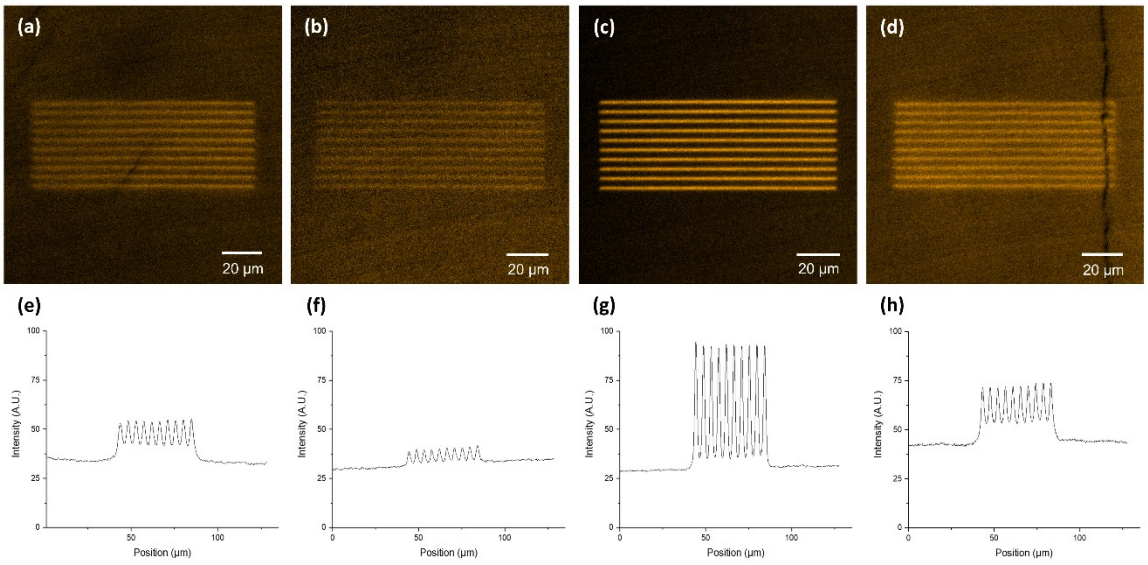

Fig. S6 Fluorescence images of patterning on the PAAm-sodium acrylate hydrogel using CF-633 NHS ester as incubation solution. (a) 405 nm, (b) 488 nm, (c) 561 nm, (d) 640 nm laser exposed for patterning. (e) Intensity profiles of (a). (f) Intensity profiles of (b). (g) Intensity profiles of (c). (h) Intensity profiles of (d).

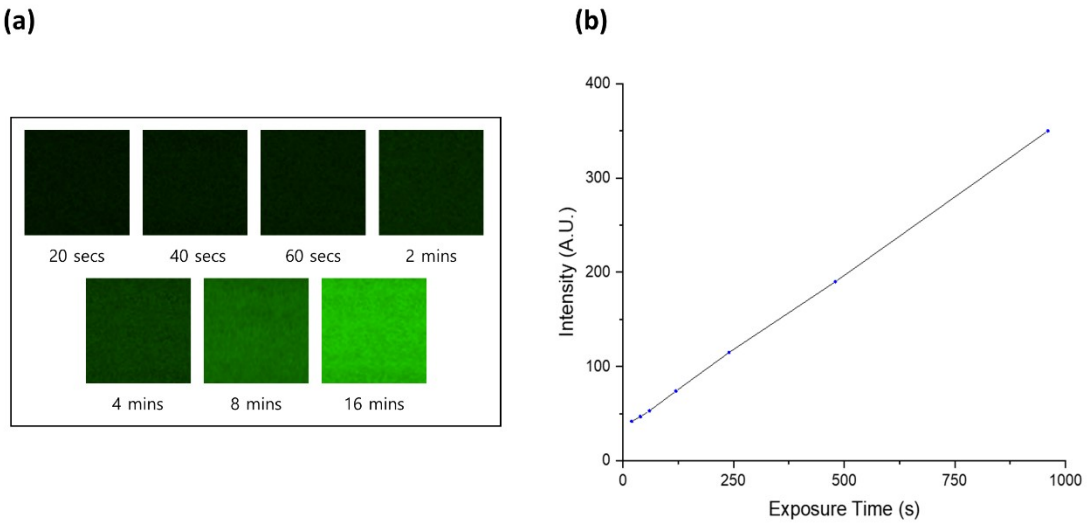

Fig. S7 Relationship between the fluorescence intensity of the patterns and exposure time. (a) Confocal microscopy images of PAAm-sodium acrylate hydrogels, which were patterned with a 405 nm laser for varying exposure times. (b) Quantitative analysis of the fluorescence intensity versus exposure time.

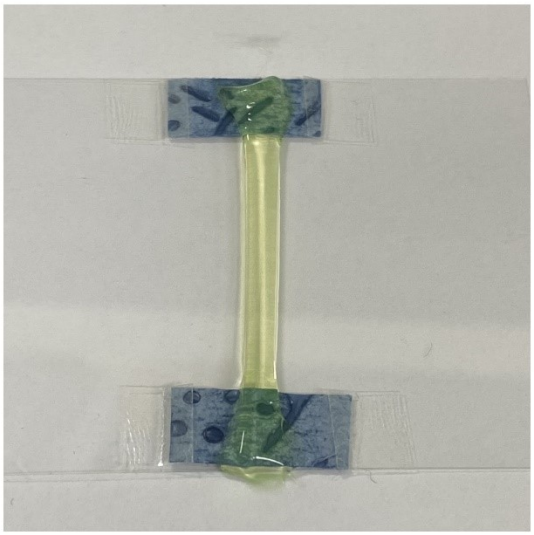

Fig. S8 Image of stretchable hydrogel mounting in the stretched state.

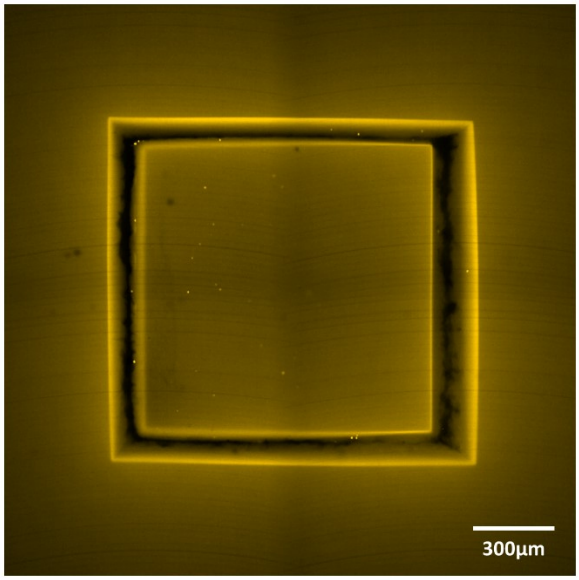

Fig. S9 Fluorescence image of the ablated hydrogels at an excessive laser power.

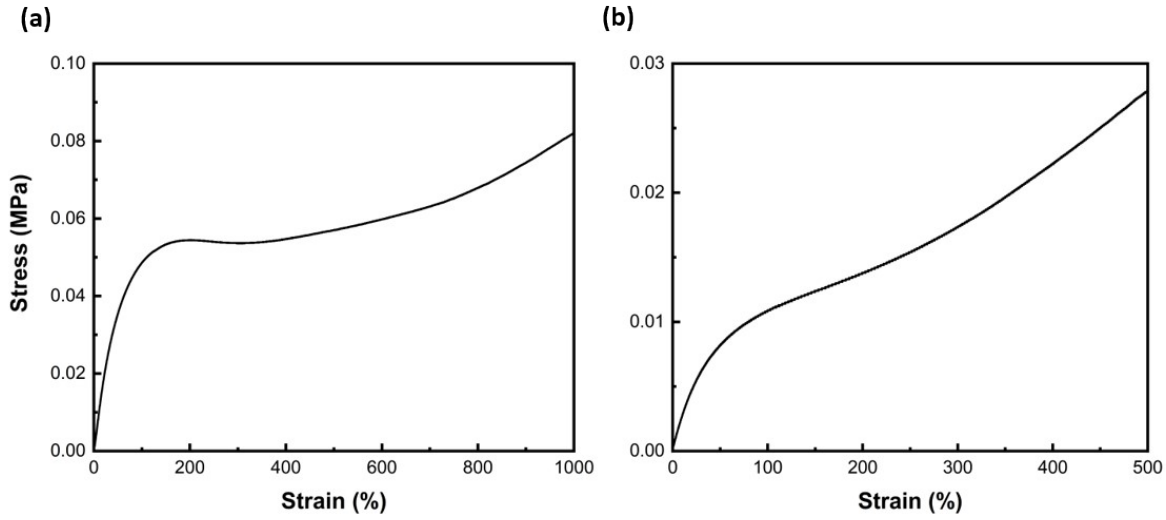

Fig. S10 Stress-strain curve of the acrylamide hydrogel (a) after synthesis and (b) after immersion in deionized water.

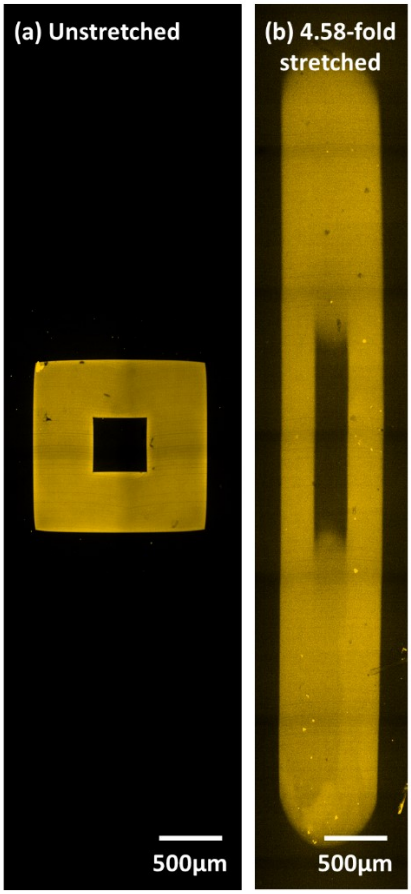

Fig. S11 Macroscopic patterning for demonstration of the local stretchability control in mm scale. Fluorescence images of patterning using 5-aminoFITC as incubation solution on the PAAm hydrogel with 405 nm laser. (a) Confocal microscopy image obtained before stretching. (b) Confocal microscopy image obtained after 4.58 times stretching.