Supplementary Information

Experimental

A typical method for the prepartion of a hydrochromic fluorescein-PVP film for sweat pore mapping is as follows. Fluorescein (33.2 mg, Aldrich) and polyvinylpyrrolidone (PVP, Sigma) (1.7 mg, Mw: 360,000 g/mol) was dissolved in 10 mL of dimethylformamide (DMF, Sigma-Aldrich) and stirred at an ambient temperature for 6 h. The fluorescein-polymer mixture was repeatly spin-coated on a glass substrate four or five times to make a film with a thickness of ca. 40 μm. Fingerprinting was conducted by gently pressing a fingertip on the surface of the sensor film for 1-10 s. Fluorescence microdots representing the sweat pore patterns were analyzed using a fluorescence microscope (excitation: 460~490 nm, BX 51W/DP70, Olympus). A digital scanner equipped with a prism was also used to visualize the friction ridge patterns on a fingertip and to compare the fluorescent sweat pore patterns. A homemade humidity-controlled chamber equipped with a hygrometer (HD 100S, Kimo) was used for hydrochromism tests under various humidiry conditions. The humidity in the chamber was set at a specific relative humidity value and the fluorescein-PVP film was placed in the chamber for 15 min after stabilization of the humidity. The sensor film was removed from the chamber and a fingerprint was deposited on the film immediately.

A latent sweat pore image was obtained using a modified ninhydrin staining method. Fingerprinting was performed by pressing a fingertip on a conventional A4 paper. A stock ninhydrin solution was prepared by dissolving ninhydrin (1.0 g, Sigma-Aldrich) in 9 mL ethanol and 1 mL acetic acid and, subsequently, diluted in methanol with 1:20 v/v. The diluted ninhydrin staining solution was sprayed on the fingerprinted area of the paper. The ninhydrin-treated paper was then placed on a hot plate at 80 °C for 20 min, resulting in the generation of the latent fingerprint image.

To compare the fluorescent sweat pore and latent sweat pore patterns, we extracted the x- and y-coordinates of sweat pore positions from each image using ImageJ software. Then, we used the sweat pore-pattern-matching process implemented in MATLAB to determine whether the positions of the fluorescent sweat pore patterns match those of the latent sweat pores. We refer the readers to the reference Lee 2014 for the detailed discussion of this procedure.

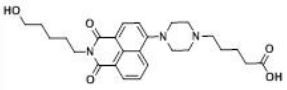
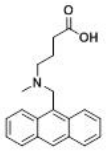
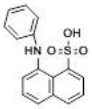
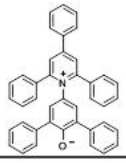
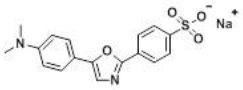
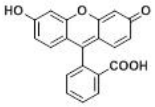
	Structure	Sweat Pore Mapping	Note	Ref
1		No	Sensitive to water in solution but not in the solid state	*Bull. Korean Chem. Soc.* **2013**, *34*, 2261-2266
2		No	Sensitive to water in solution but not in the solid state	*Org. Biomol. Chem.* **2011**, *9*, 1314-1316
3		No	Blue-fluorescent in the solid state. But its fluorescence is quenched by water.	*J. Photochem. Photobiol. A: Chem.* **1994**, *84*, 91-96
4		Yes	Poor quality	*J. Appl. Polym. Sci.* **1997**, *63*, 1681–1691
5		No	Sensitive to water in solution but not in the solid state	*Anal. Chem.* **2011**, *83*, 928–932
6		Yes	High resolution mapping possible Sensitive to water in solution and solid states	

Table S1. Hydrochromic materials investigated in this study. Compounds **1** and **2** were prepared according to the literature procedures. The hydrochromic materials **3-6** were commercially available from Sigma-Aldrich (**3**: 8-Anilino-1-naphtalenesulfonic acid (ANSA), **4**: 2,6-Diphenyl-4-(2,4,6-triphenyl-1-pyridinio)phenolate (Reichardt's dye)), Invitrogen (**5**: Dapoxyl® sulfonic acid, salt), and Aldrich (**6**: Fluorescein).

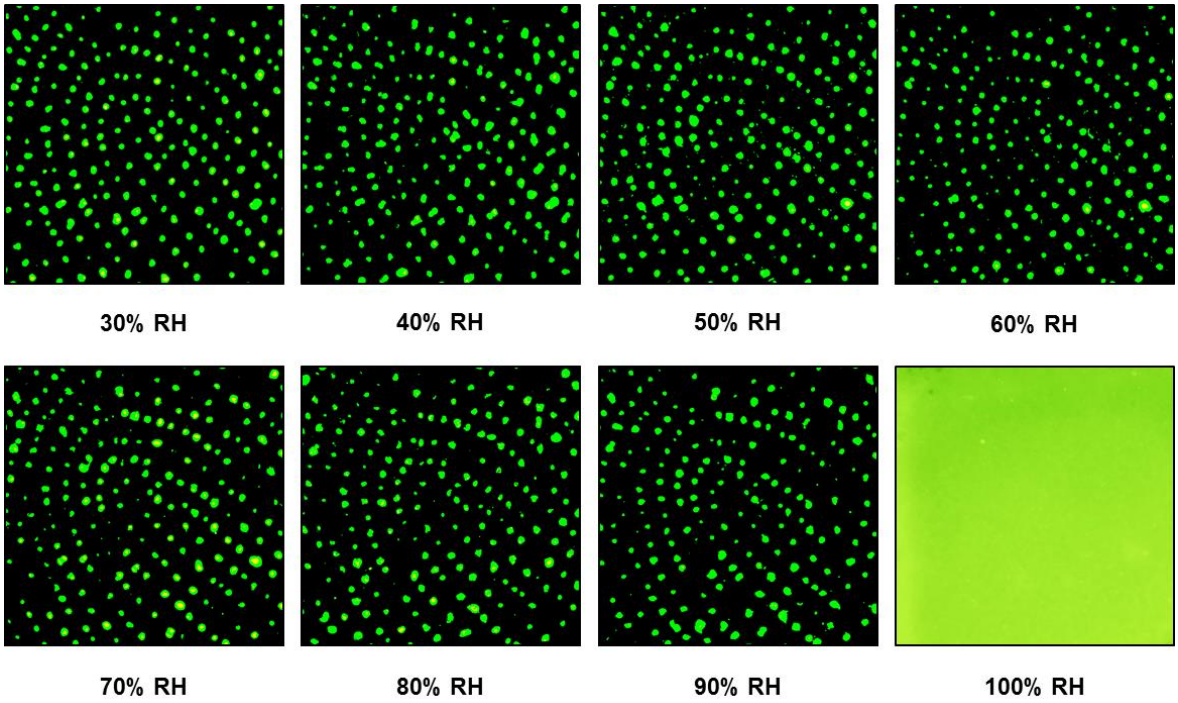


Figure S1. Contrast-adjusted fluorescence microscope images of fingerprints marked on fluorescein-PVP films under different relative humidity (RH) conditions (15 min).

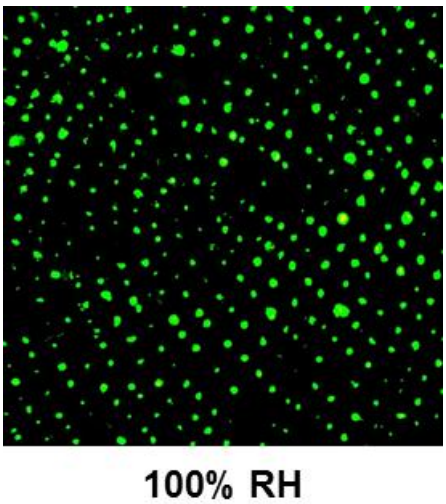


Figure S2. Contrast-adjusted fluorescence microscope images of fingerprints marked on fluorescein-PVP films obtained after heat treatment (60 ^{o}C, 3 min) of the sensor films which were exposed to a 100% relative humidity (RH) condition prior to fingerprinting.

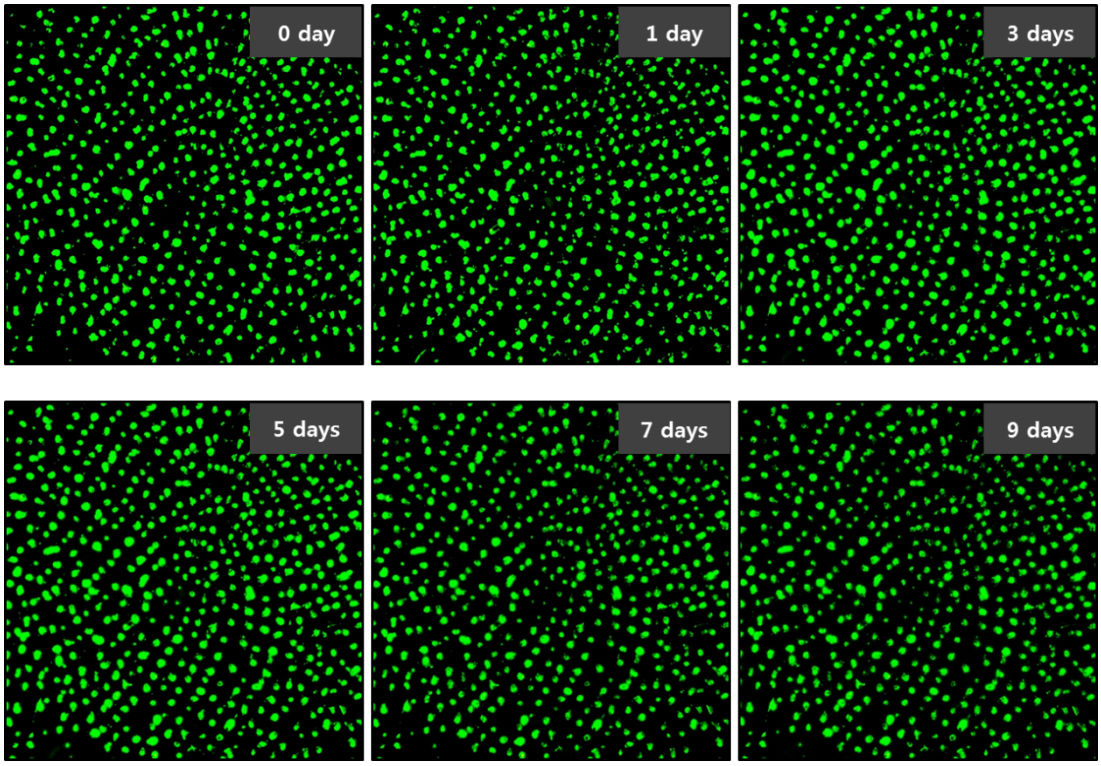


Figure S3. Contrast-adjusted fluorescence microscope images monitored for a 9 days period of fingerprints marked on a fluorescein-PVP film.

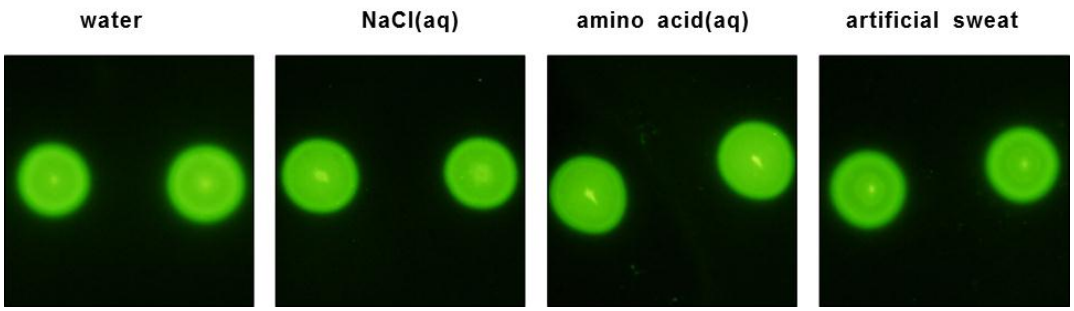


Figure S4. Fluorescence microscope images of fluorescein-PVP films after exposure to various aqueous solutions. The concentration of NaCl aqueous solution is 0.5% (86 mM). The amino acid solution contains major amino acids among sweat components in 1 L water: serine (0.4367 g), glycine (0.2926 g), alanine (0.1223 g), threonine (0.0742 g), and methionine (0.0742 g).The artificial water was prepared by dissolving 1 g of the amino acid mixture and 5 g NaCl in 1 L distilled water.

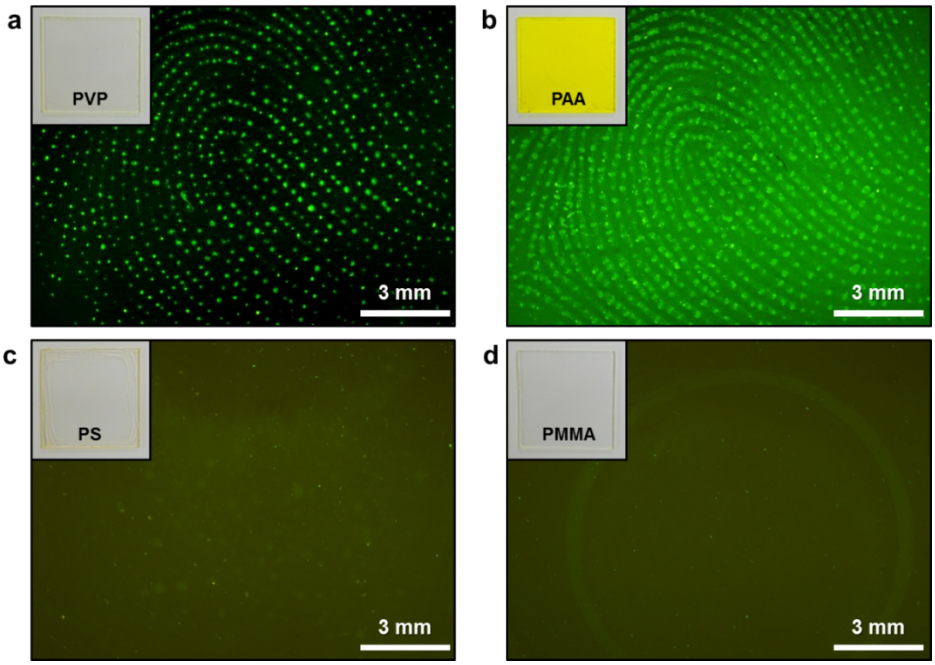


Figure S5. Fluorescence microscope images of fingerprints marked on fluorescein-polymer films in which polyvinylpyrrolidone (PVP), polyacrylic acid (PAA), polystyrene (PS), and polymethyl methacrylate (PMMA) are used as matrix polymers. The inset in each figure shows a photograph of the film.

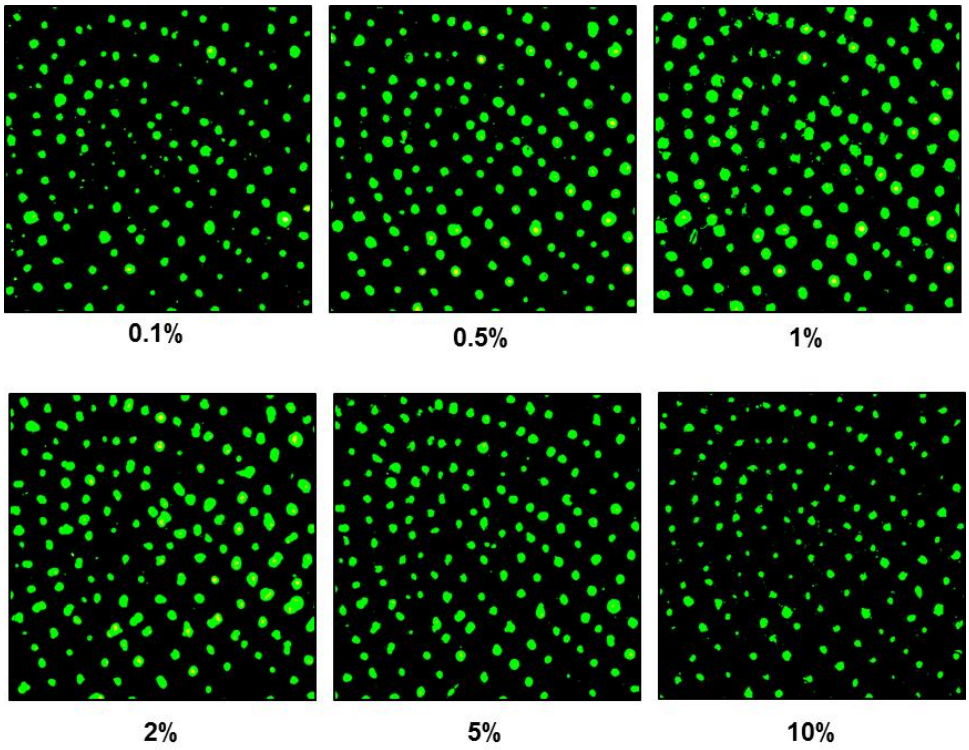


Figure S6. Fluorescence microscope images of fingerprints marked on fluorescein-PVP films containing various amounts of fluorescein.

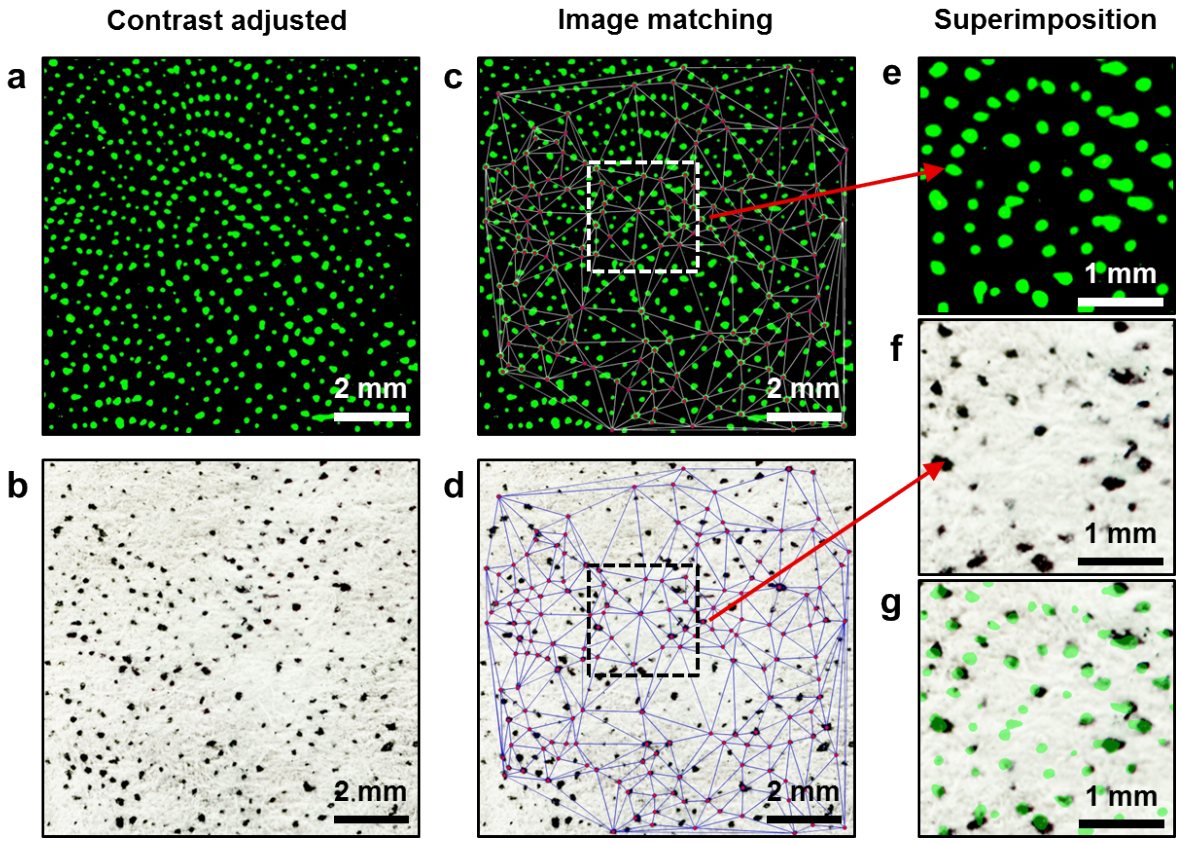


Figure S7. (**a**,**b**) Contrast-adjusted fluorescence microscope fingerprint image printed on a fluorescein-PVP film (**a**) and a latent image of the same fingerprint developed with ninhydrin (**c,d**) Sweat-pore-pattern matching of the two images shown in (**a**) and (**b**), respectively. The red colored dots, obtained from the image matching process, indicate the matching points between the two images. (**e**,**f**) Magnified images of marked areas in (**c**) and (**d**). (**g**) Superimposed image of (**e**) and (**f**). The latent fingerprint image shown in (**d**) was obtained by pressing a fingertip on an unmodified paper followed by staining with ninhydrin. The original purple colored dots obtained from ninhydrin staining were transformed to black colored dots using a Photoshop program because overlapping red colored fluorescence image (**e**) with the black colored dots (**f**) results in a better superimposed image (**g**).

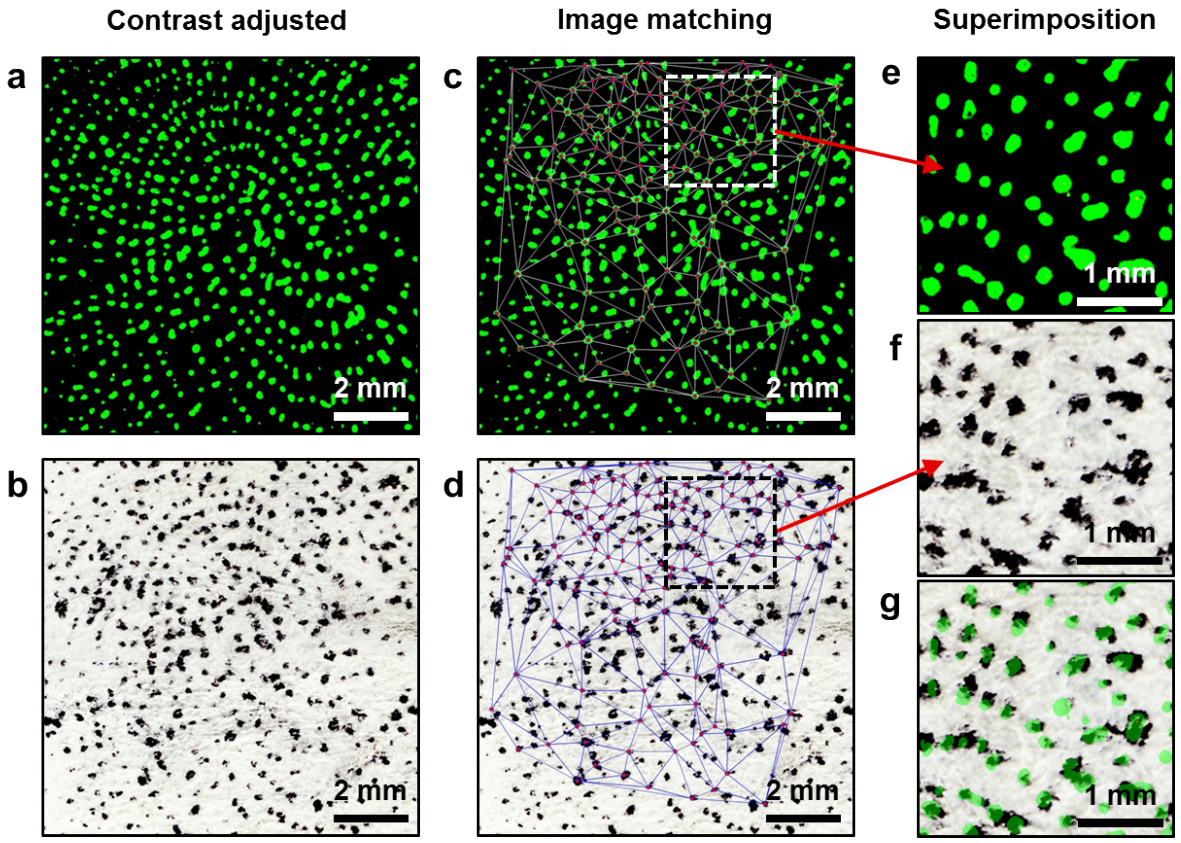


Figure S7 continued

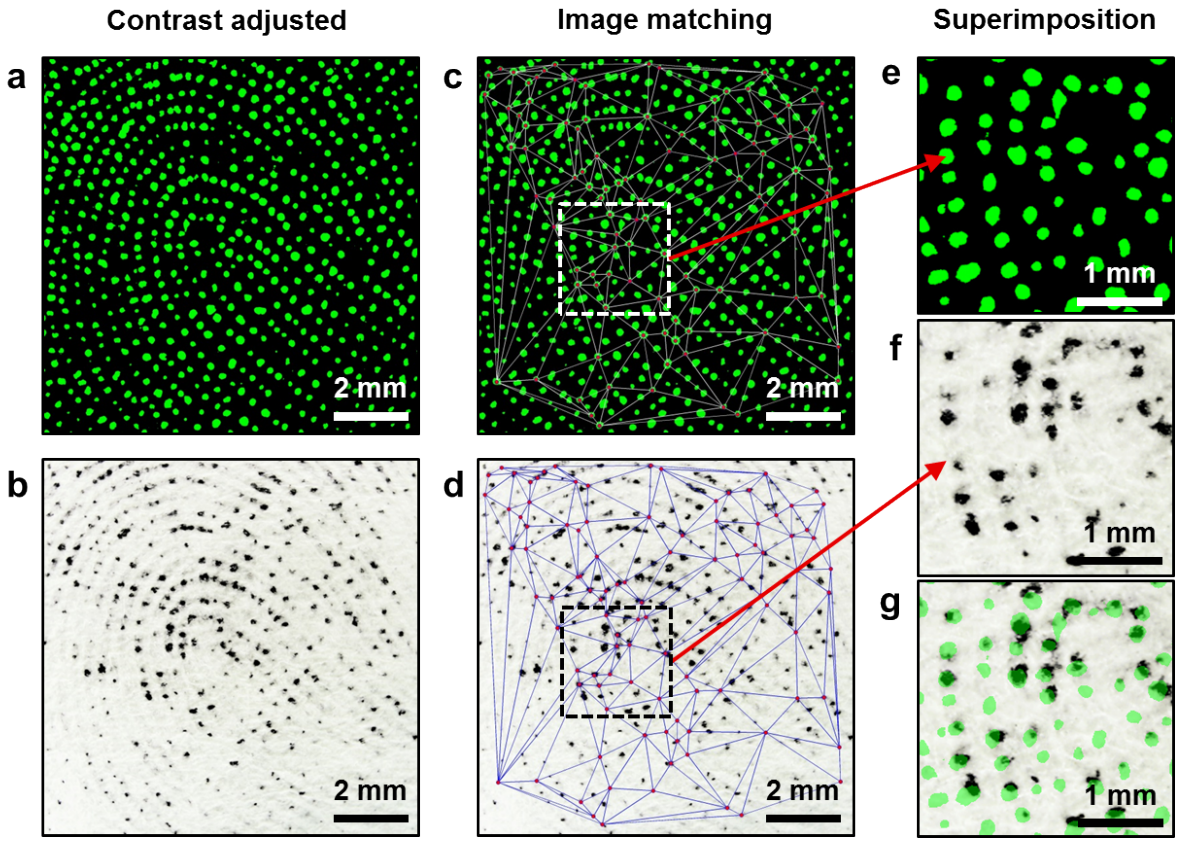


Figure S7 continued

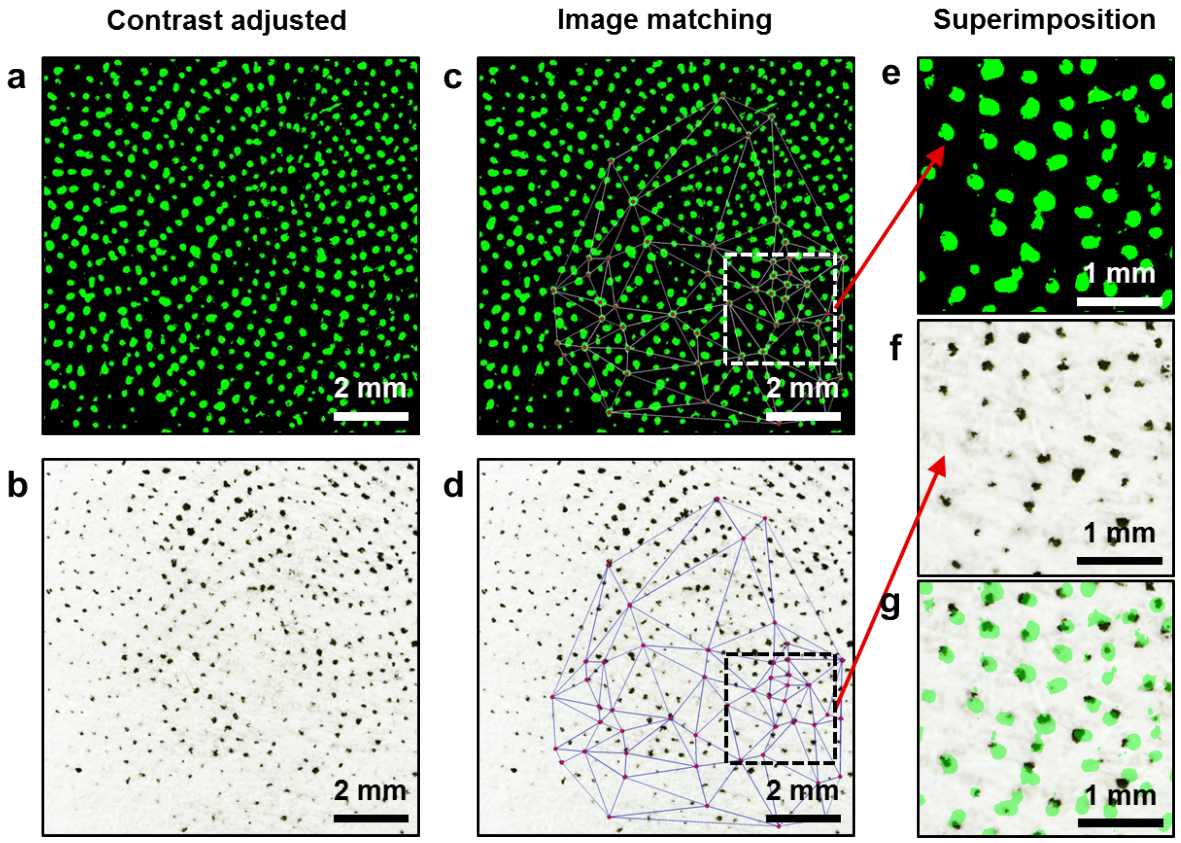


Figure S7 continued

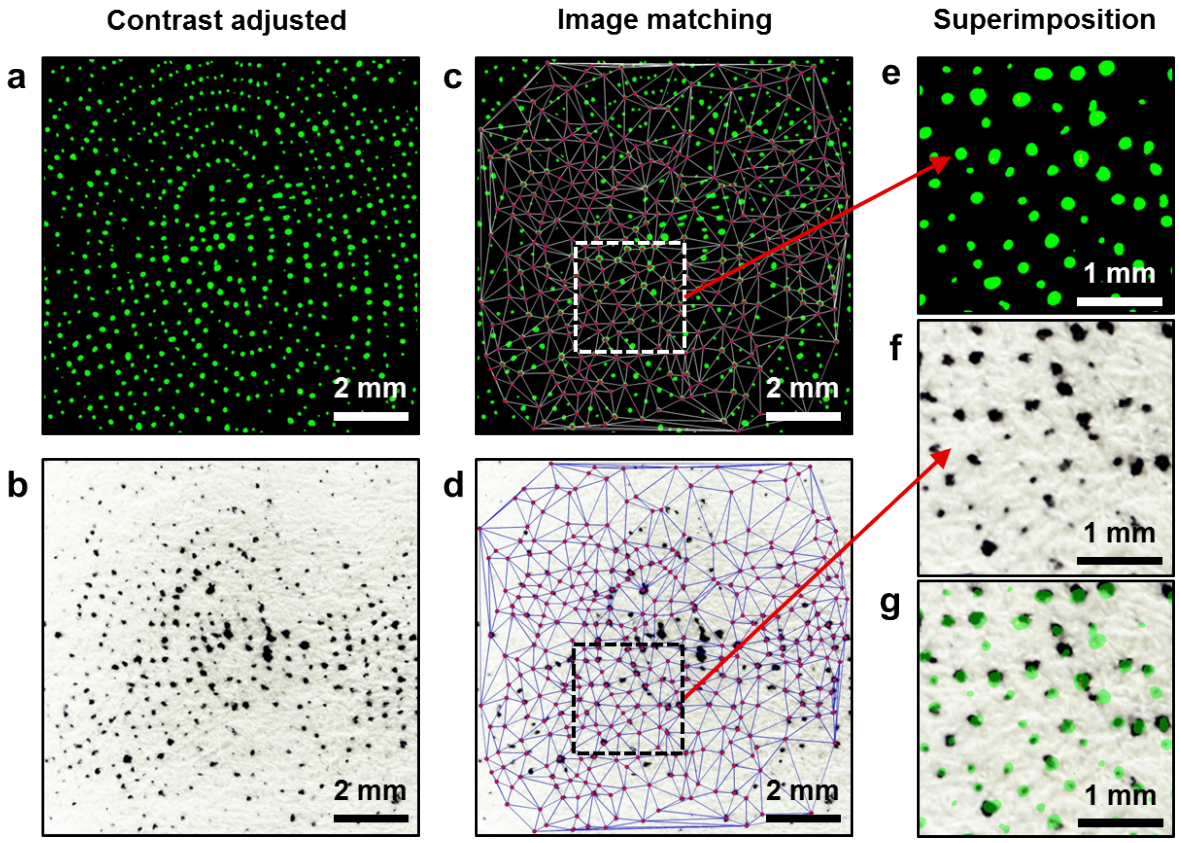


Figure S7 continued