Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Information

Photolithography–Enabled Direct Patterning of Liquid Metals

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Supplementary Figures

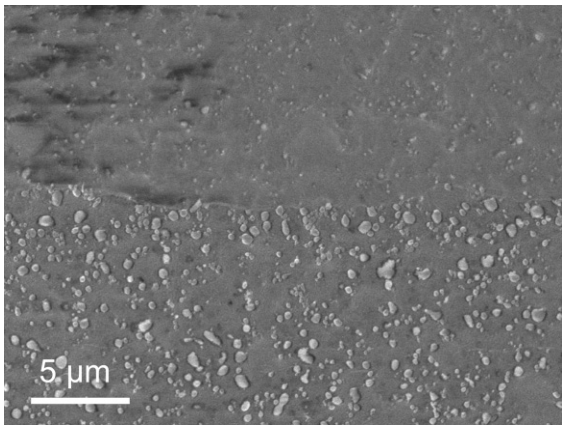

Fig. S1 SEM image showing the border between a developed and undeveloped area. The lower part of the image shows some EGaIn particles upon applying the developer solution. The alkaline solution dissolves the thin photopolymer layer and the oxide layers on the particles, making the particles visible under SEM.

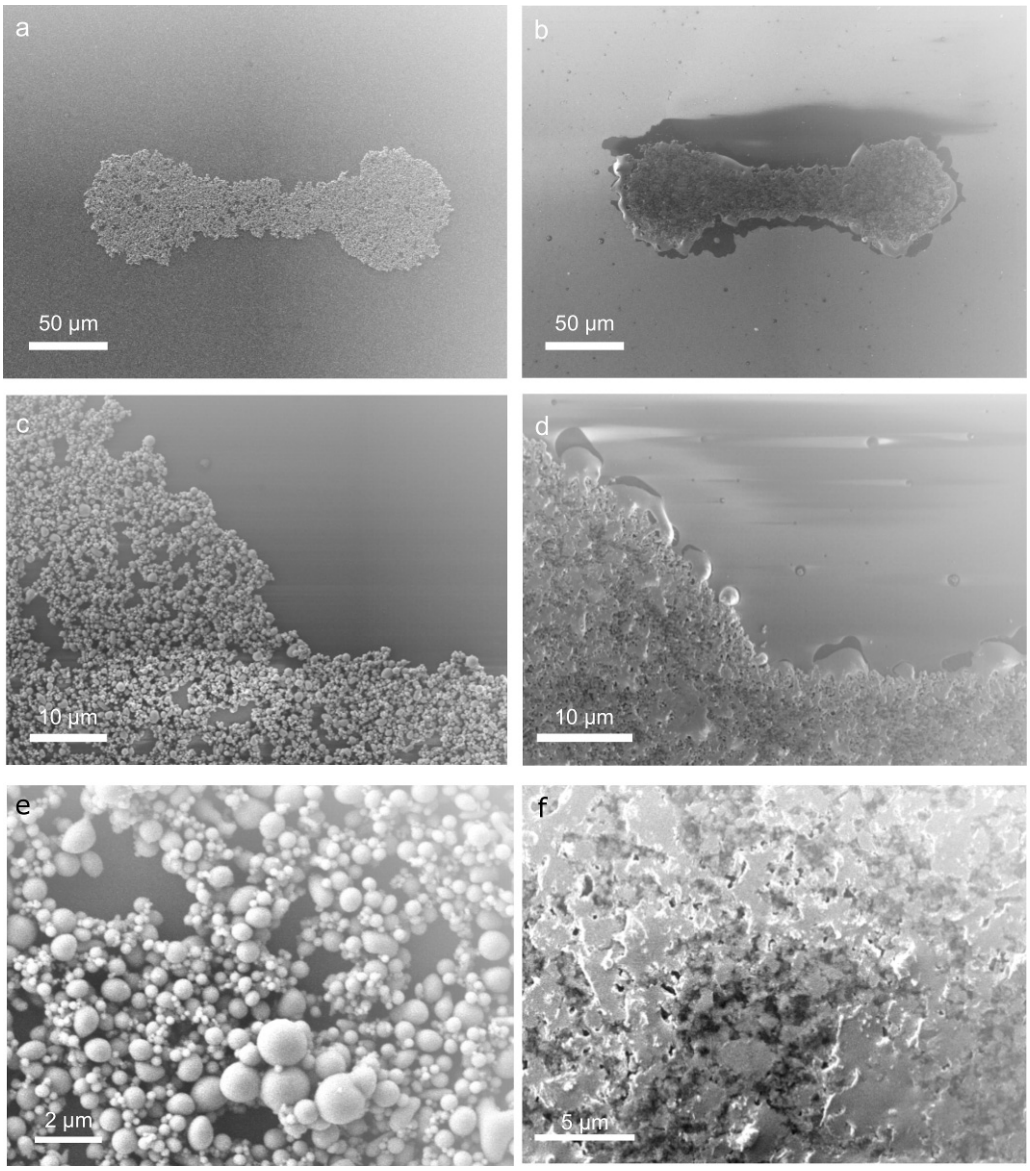

Fig. S2 SEM images of an invert design pattern a) before and b) after pressing (5 vol% of EGaIn dispersion). c–f) High magnification images of an edge of the original patterns. On the left, the images (c and e) show the particles are separated and stabilized by their oxide layer and a slight amount of photopolymer which has mostly been dissolved in the developer after the development stage. On the right, photographs (d and f) show that the particles are sintered after mechanical pressure creating conductive liquid metal networks.

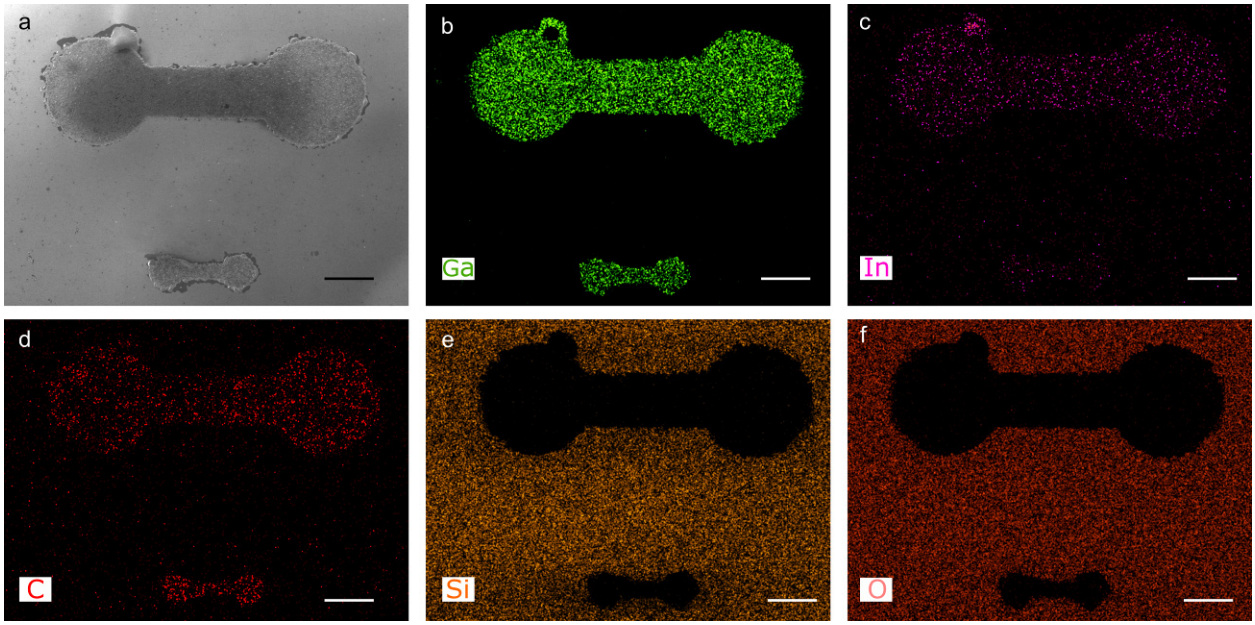

Fig. S3 EDS mapping of an inverted design pattern on a) quartz substrate for b) Ga, c) In, d) C, e) Si and f) O. A small amount of carbon detected in the patterns, is attributed to the presence of photoresist in between the particles. Small detection of In in the patterns is due to the low voltage of the EDS taken (5 V) rendering it difficult to detect In. The silicon and oxygen outside of the patterns indicate the quartz substrates. Scalebar: 100 μm.

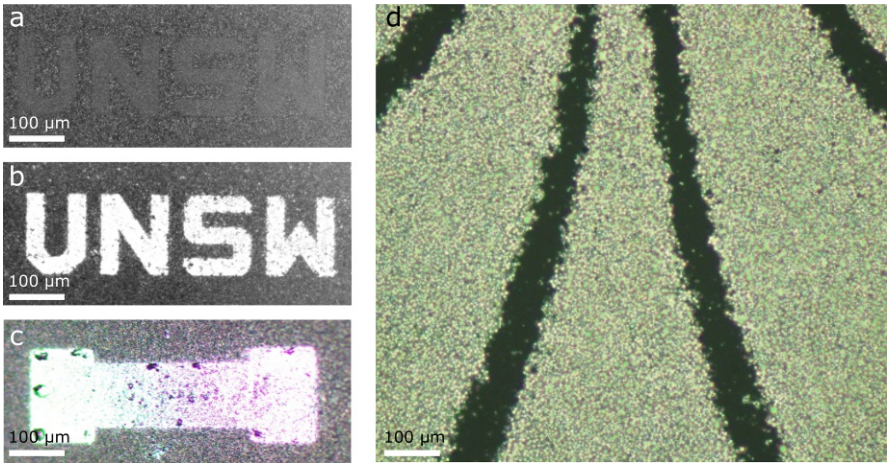

Fig. S4 Optical images of a positive design pattern a) before and b) after pressing on quartz (before pressing the photopolymer is washed out from the letters' grooves, and c) a positive design attempted on Kapton. d) An image showing that after a high dosage of UV, EGaIn particles could be completely washed away from the grooves.

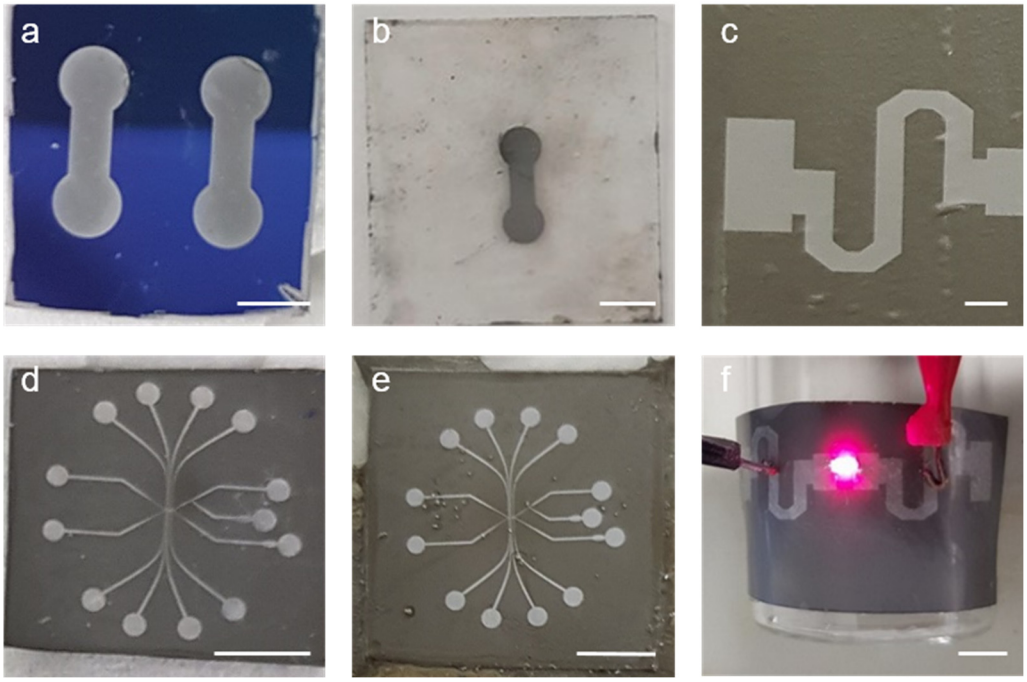

Fig. S5. Design patterns on a variety of substrates. a) An inverted design on Si wafer with oxide layer, b) an inverted design on polypropylene substrate, c) a positive design on latex substrate, d) a positive design on Si wafer with oxide layer, e) a positive design on polypropylene. f) Circuit design on polypropylene to light up an LED under bending demonstrating the potential of this direct patterning approach. Scale bars present 3 mm.