A Modified Abstraction of Sierpiński Fractals towards Enhanced Functionalities of Cross-Coupled Bow-tie Nanostructure

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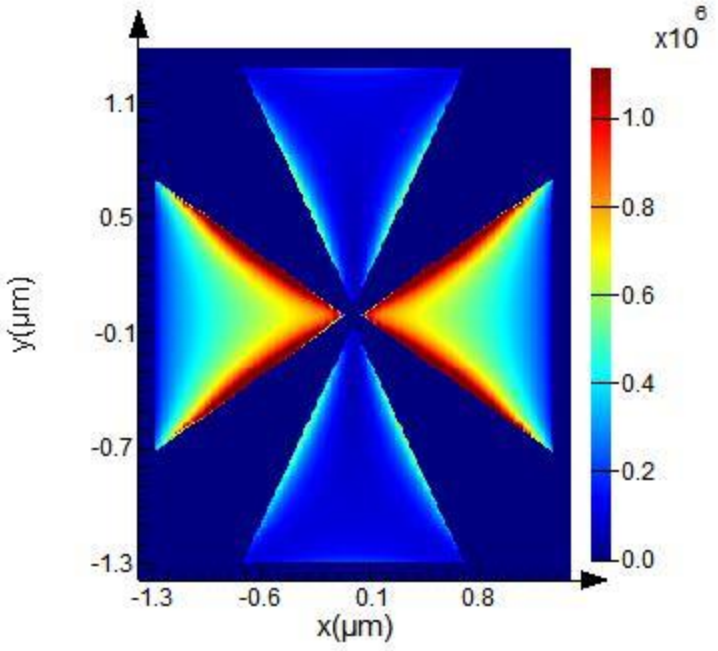
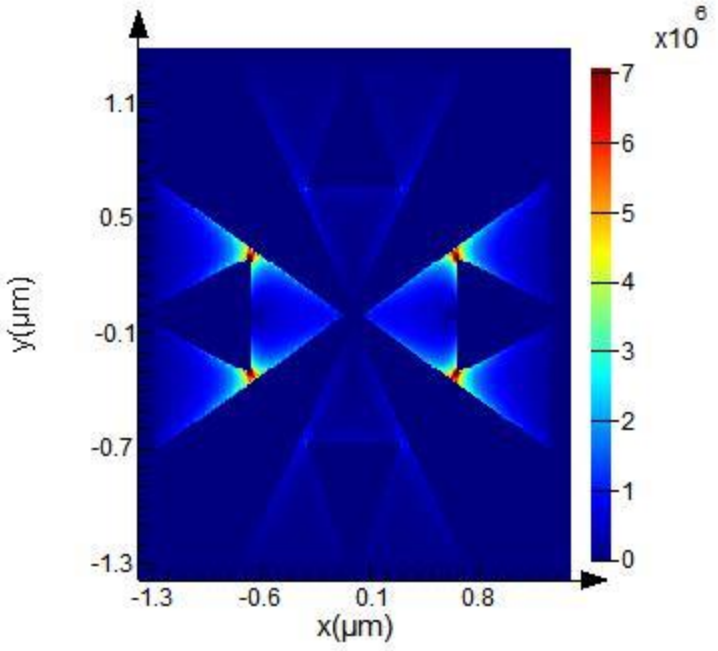
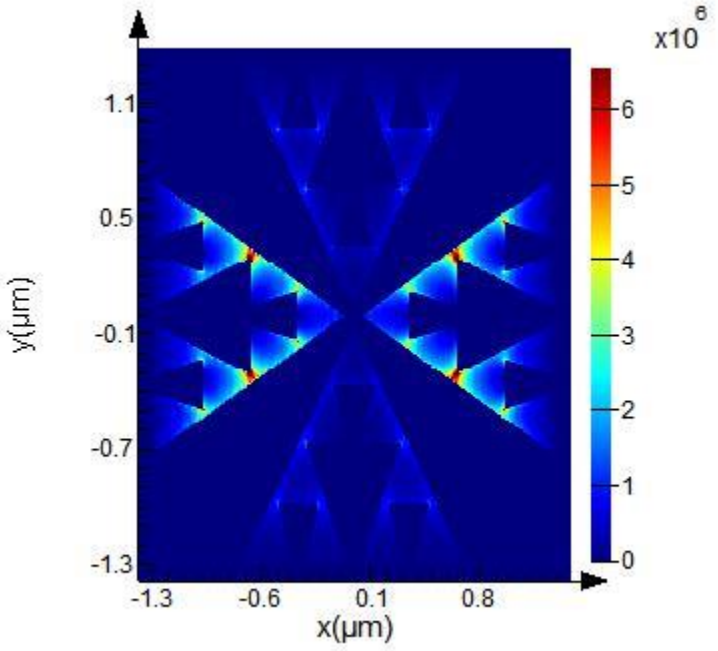
(a) Polarization current density



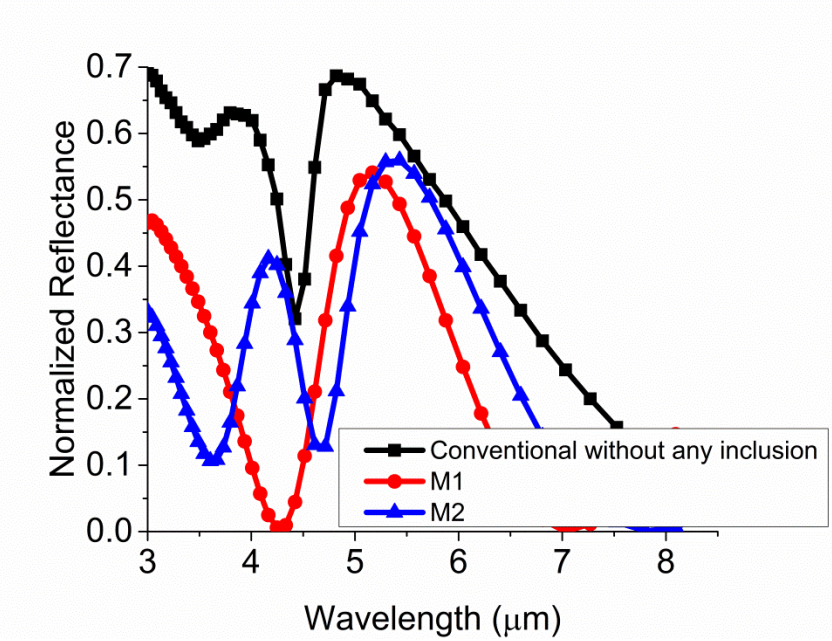
FigureS1. Time averaged polarization current density Jin conventional bow-tie structure at dipolar resonance



FigureS2. Time averaged polarization current density Jin M1 structure at dipolar resonance



FigureS3. Time averaged polarization current density Jin M2 structure at dipolar resonance



FigureS4. Improvement of dipolar resonance contrast by fractalization in simulation

(b) Spatially distinct resonances

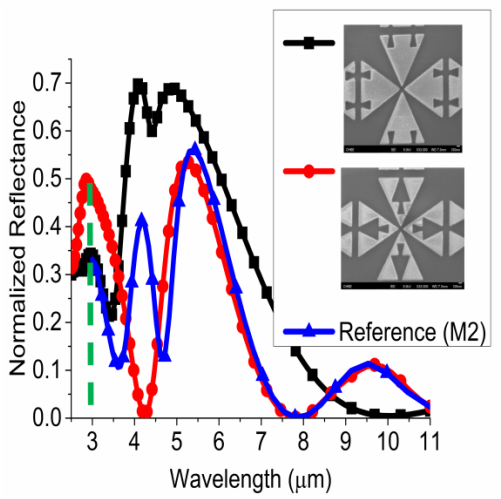
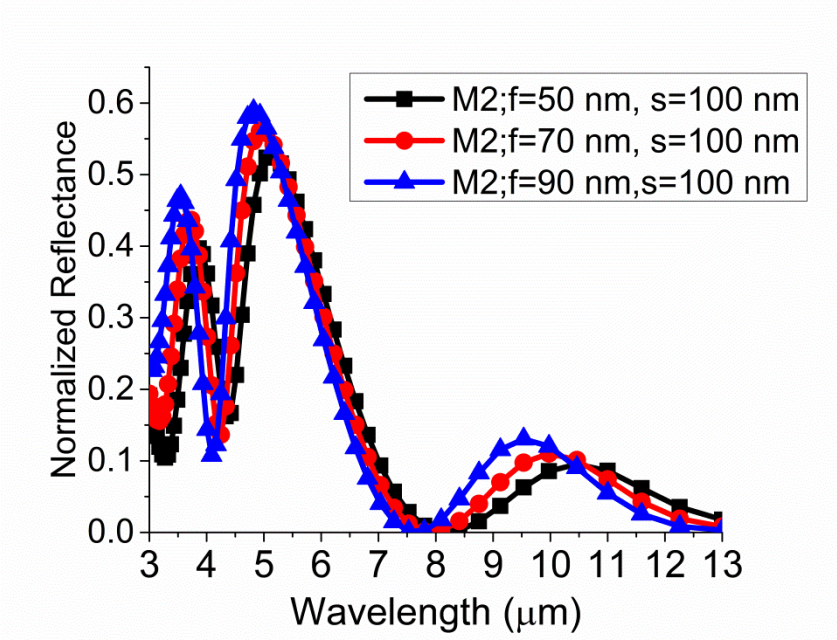


Figure S5. Simulation of spatial distinctiveness of the resonant peaks. The green dashed line indicates the transverse mode, which is currently not the focus of this work

(c) Geometric effect



FigureS6. Effect of f on resonance characteristics of M2 in simulation

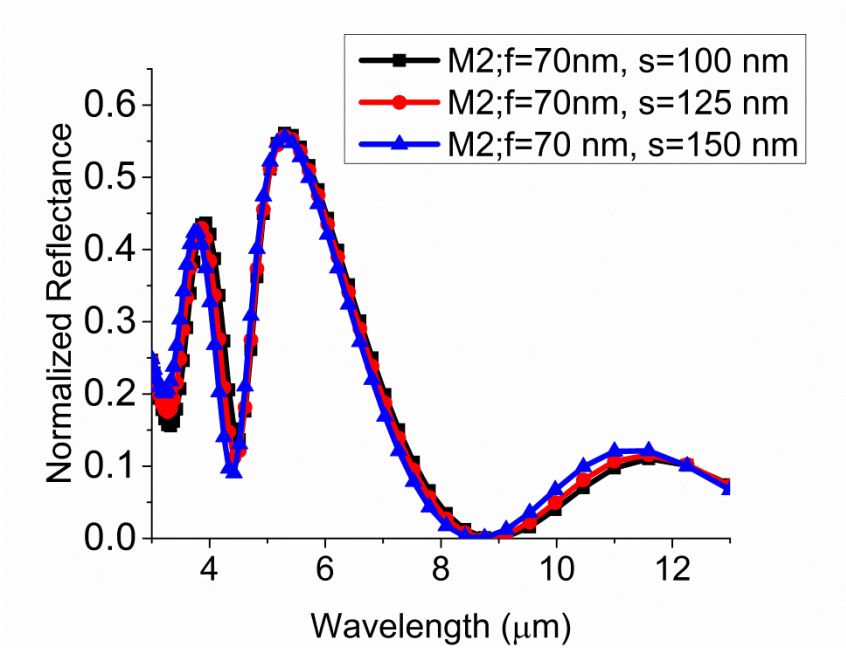


Figure S7. Effect of s on resonance characteristics of M2 in simulation

(d) AFM height analysis of ultrathin film

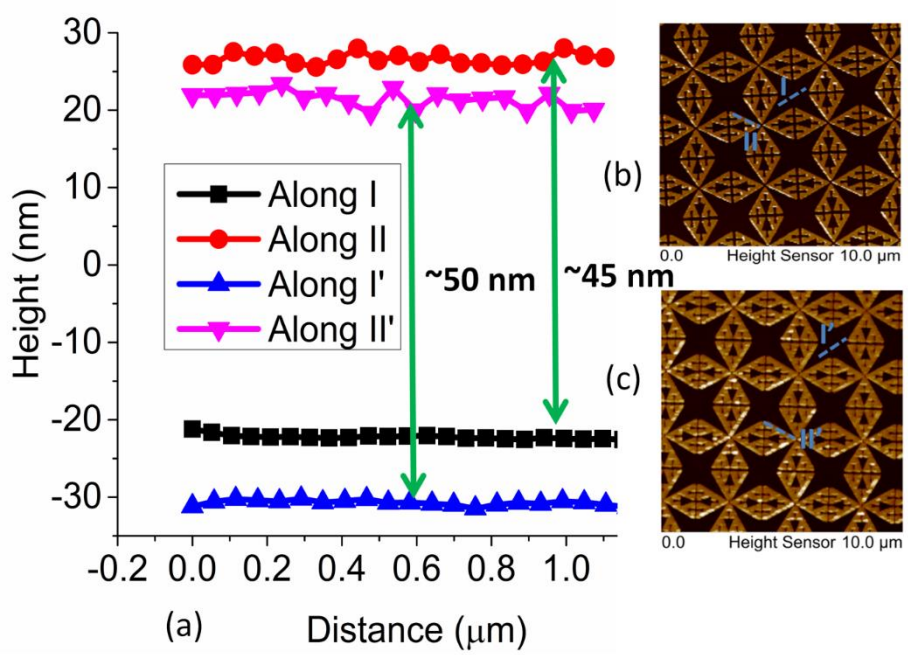


Figure S8. AFM height analysis of the ultrathin film (~ 5 nm) (b) before spin coating (c) after spin coating

(e) Chemical dewetting process

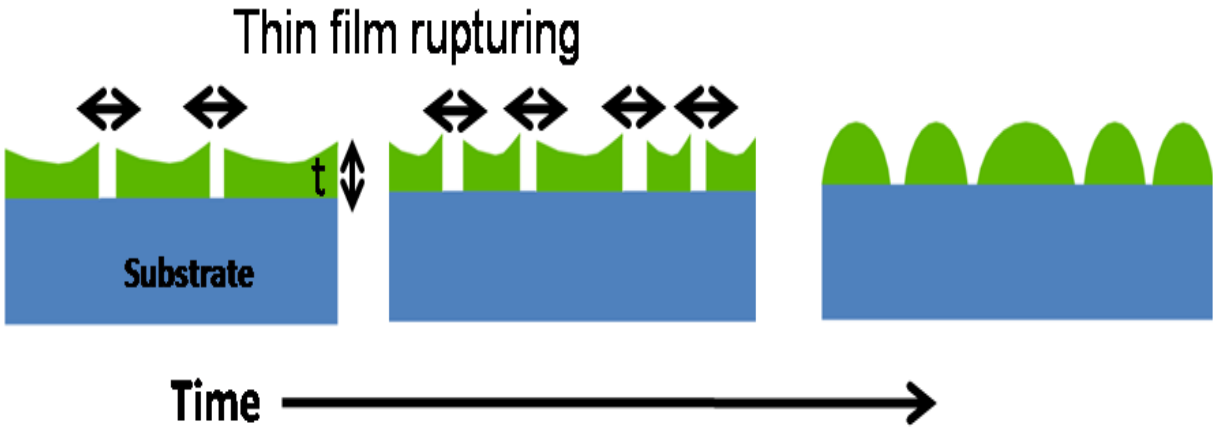


Figure S9. Illustration of thin film dewetting process as a function of time

(f) AFM height analysis of the chemical dewetting process

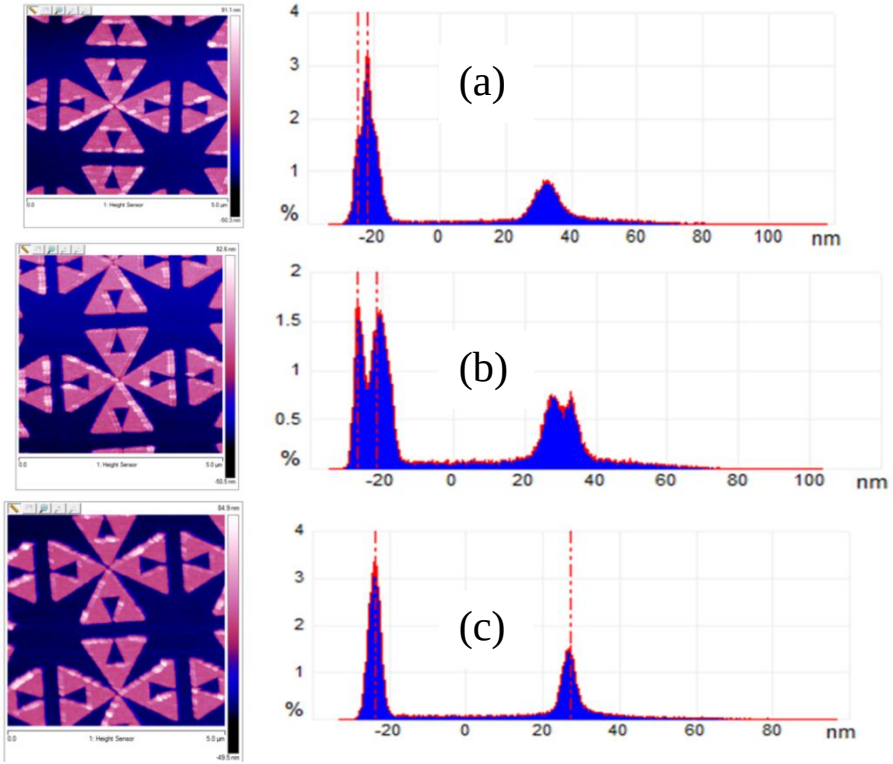
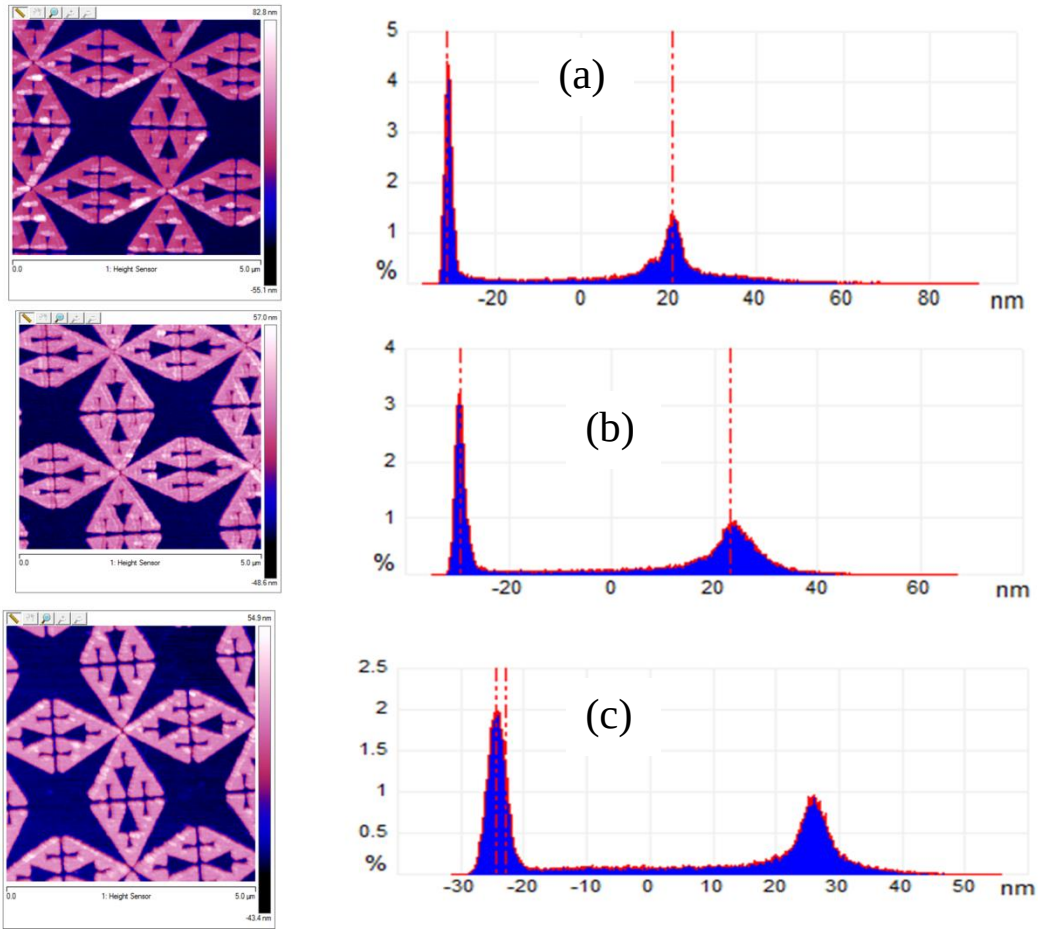


Figure S10.AFM height profile (left panel) and calculated histogram (right panel) for M1 (a) 0d (b) 3d (c) 7d



FigureS11. AFM height profile (left panel) and calculated histogram (right panel) for M2 (a) 0d (b) 3d (c) 7d

(g) FESEM-EDX analysis

To locate the randomly dispersed carbon atoms once the dewetting equilibrium is reached, we carry out the FESEM/EDX mapping of the sample as shown in the following figure. The acceleration voltage , probe current, counting rate and the collection time are maintained at 15 KV, 1 nA, 2789 s^{-1} and 30 s , respectively. It can be observed that the carbon atoms are randomly dispersed across the sample surface. The preferential positioning of the PMMA particles as observed in the phase mapping is difficult to identify in this case. The mass % of Au and C are found to be for 6.85% and 5.19%, respectively for a scanning area of 150×150 μm^2as shown in Figure S15.

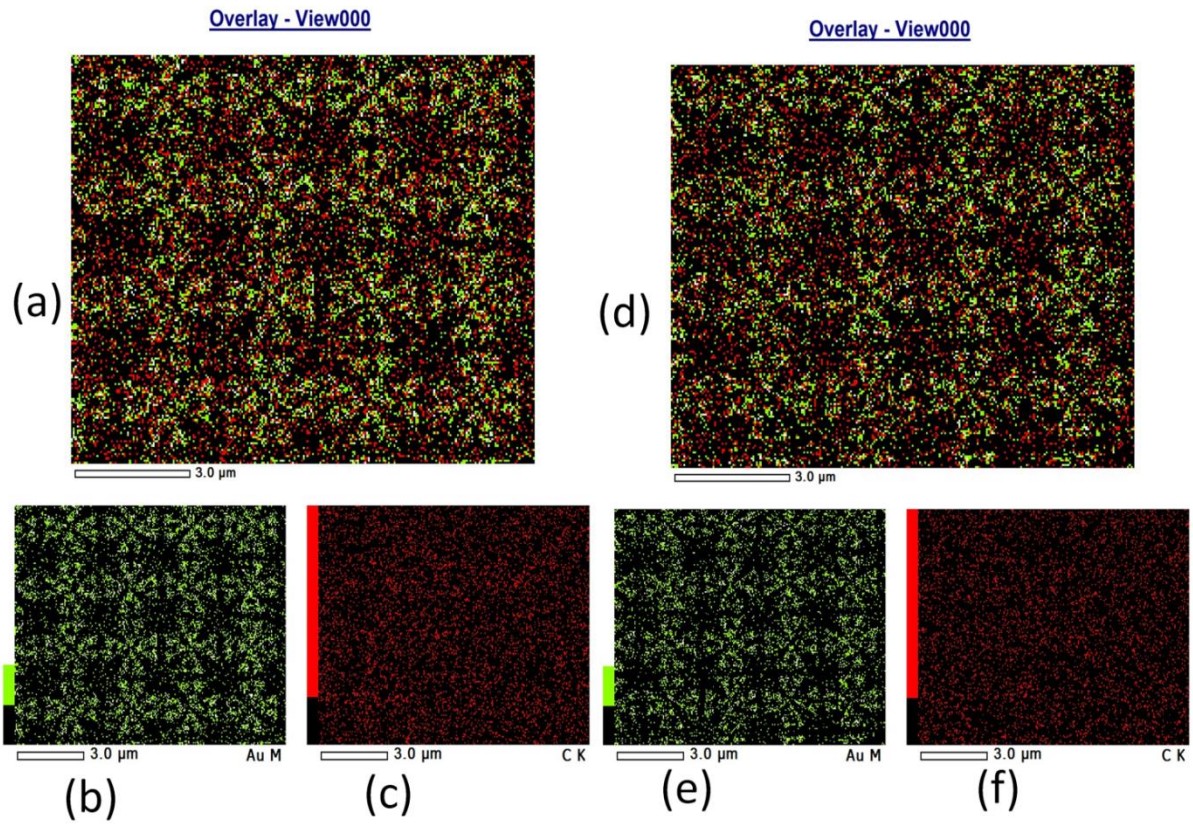
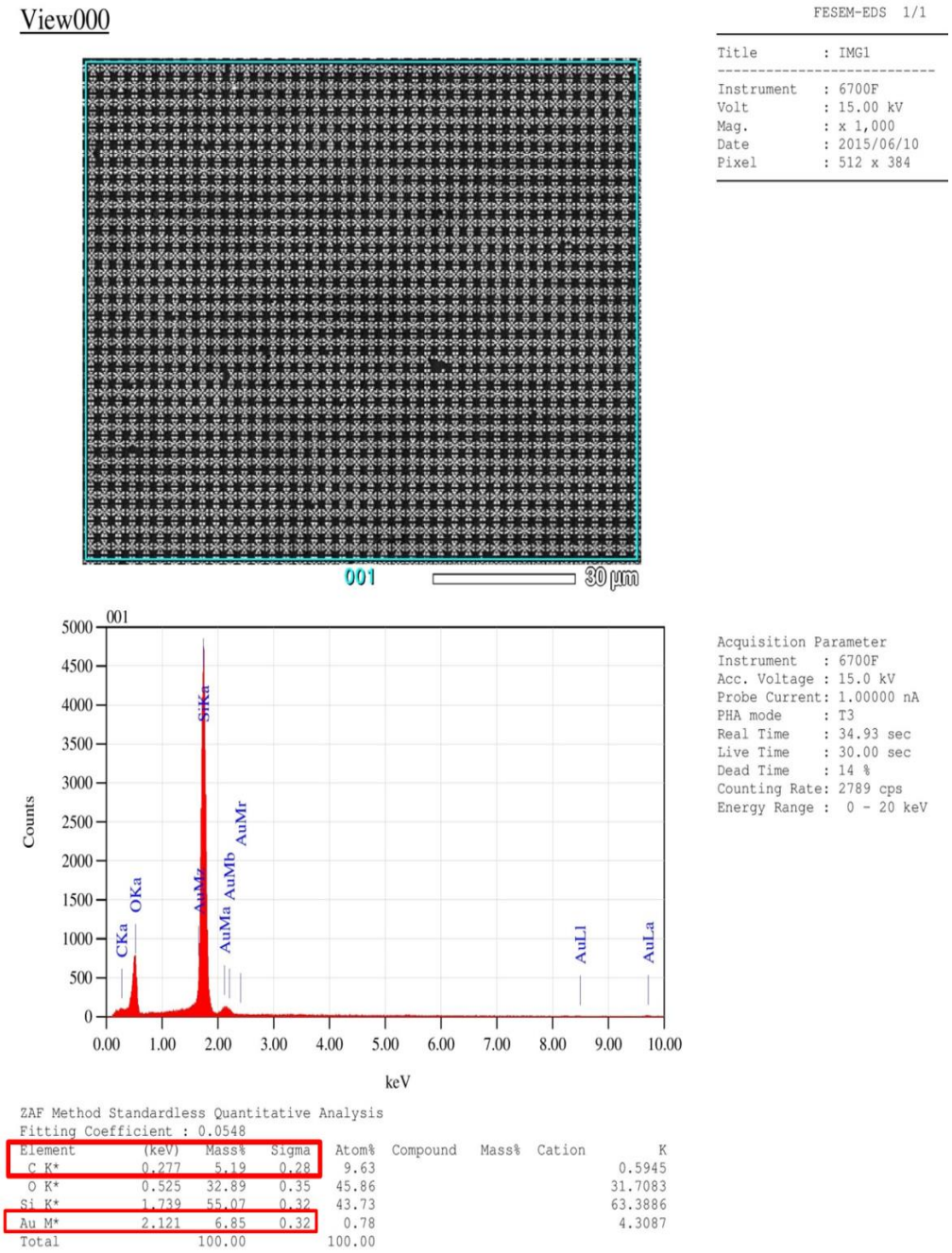


Figure S12. (a) FESEM-EDX overlay image of M1 device (b) mapping of M1 gold patterns (c) mapping of the dispersed carbon samples (d) FESEM-EDX overlay image of M2 device (e) mapping of M2 gold patterns (f) mapping of the dispersed carbon samples



FigureS13. Chemical analysis on M1 sample over an area of 150 by 150 µm^2 .The corresponding chemical (C and Au) percentages are marked by the red triangles