Electronic Supplementary Material (ESI) for Nanoscale Horizons.

Supporting Infromation for：

Direct electroplating of Ag nanowires using superionic conductors

Zeliang Guo[a], Yusen Zhao[a], Shipeng Sun[a] and Hui Wu[a,*]

[a] State Key Lab of New Ceramics and Fine Processing, School of Materials Science and Engineering, Tsinghua University, Beijing 100084, China

** Correspondence: huiwu@tsinghua.edu.cn*

We have recorded the I-t curve of the electroplating process (**Fig. S1**), and the electrodeposited layer is characterized in detail. Optical (**Fig. S2**) and SEM pictures (**Fig. S4** and **Fig. S5**), XRD (**Fig. S3**) and EDS (**Fig. S6**) results are presented to show the composition, and detailed morphology of the plated layer, which is made of uniformed nanowire arrays.

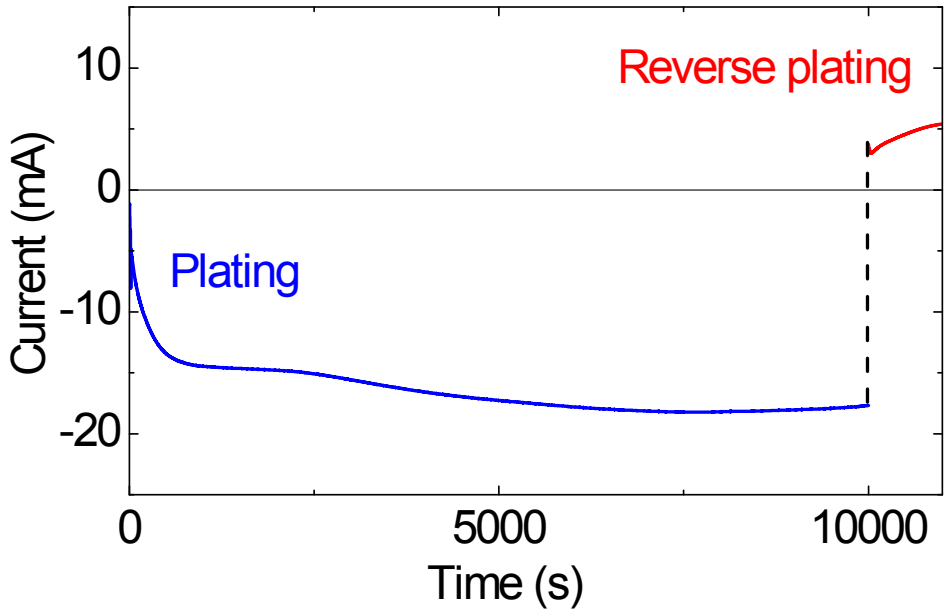

Figure S1. Current-time curve of all-solid electrodeposition Ag. The all-solid electrodeposition process consists two consecutive sessions. During the 0-10000s plating session, the voltage is set at -0.05V for Ag to deposit on the substrate. During the 10000-11000s plating session, the voltage is set at 0.05V for the interfaced Ag to slightly dissolve.

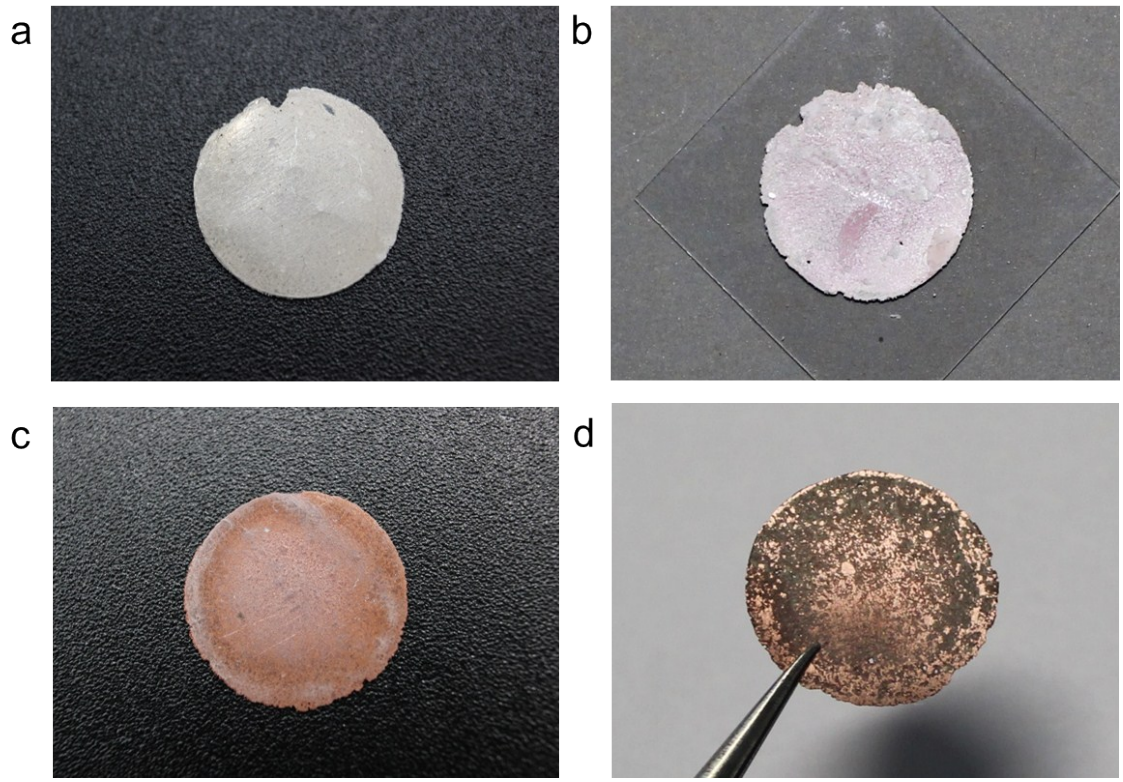

Figure S2 Photos of all-solid electrodeposited Ag and Cu layers. a) The “to the electrode side” of Ag layer; b) The “to the electrolyte side” of Ag layer; c) The “to the electrode side” of Cu layer; d) The “to the electrolyte side” of Cu layer.

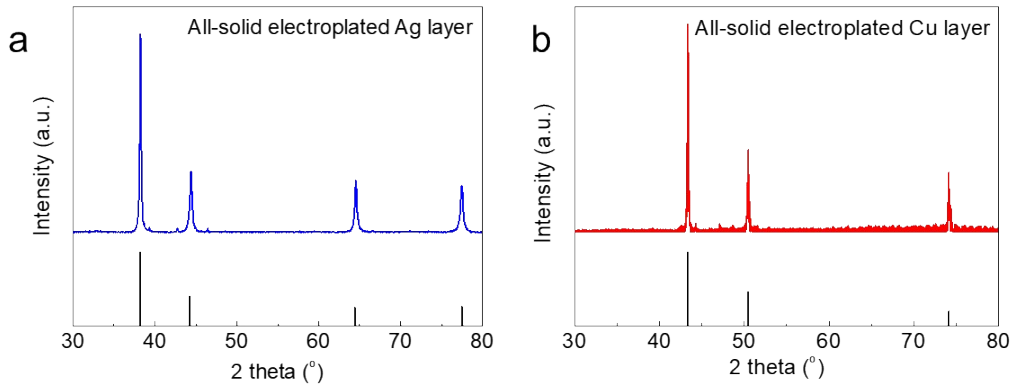

Figure S3 XRD results of all-solid electrodeposited Ag and Cu layers. a) All-solid electrodeposited Ag layer. b) All-solid electrodeposited Cu layer.

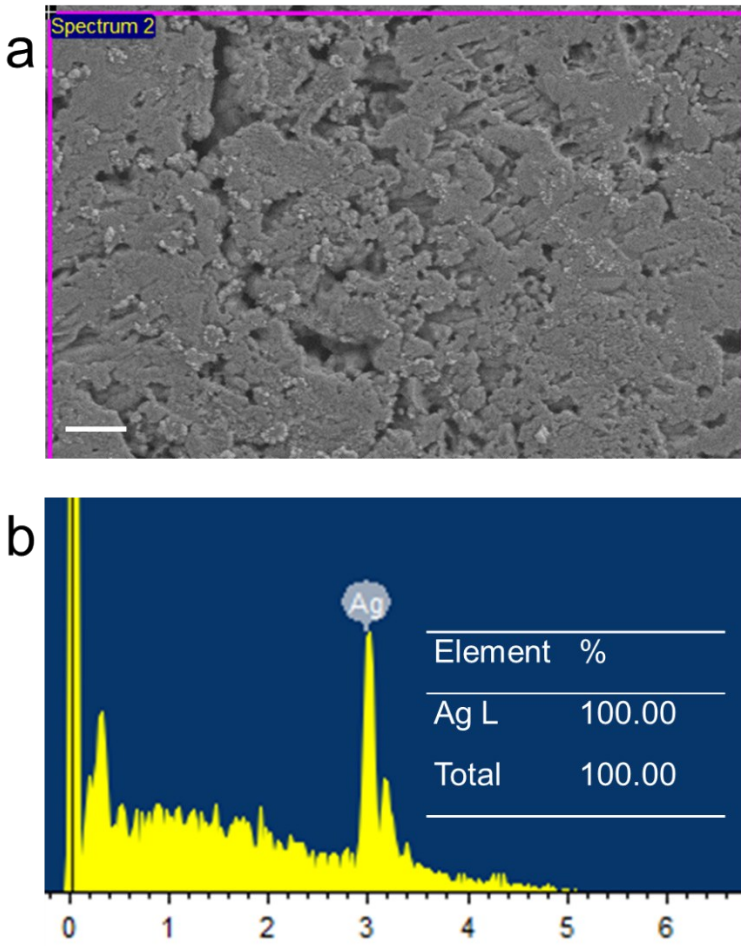

Figure S4. EDS results of Ag nanowire arrays. The layer is made of pure Ag. Scale bar, 1 μm (a).

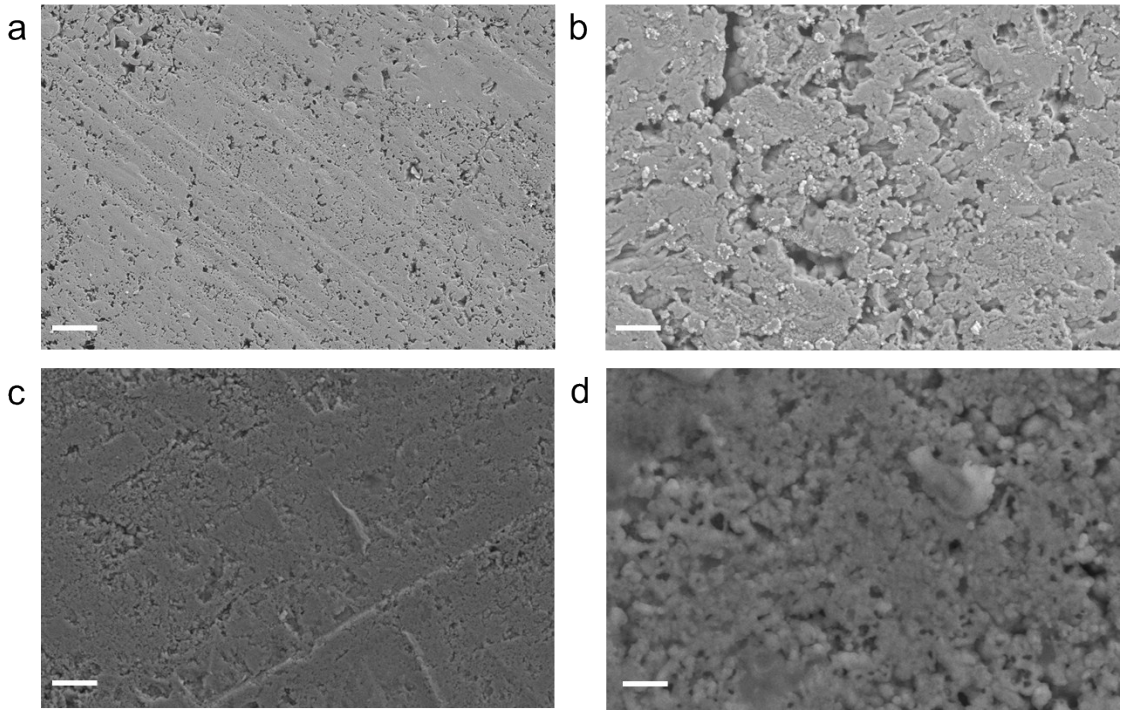

Figure S5 SEM pictures showing the surface morphology of all-solid electrodeposited Ag and Cu layers. a) and b) Surface of all-solid electrodeposited Ag layer. c) and d) Surface of all-solid electrodeposited Cu layer. Scale bar, 5 μm (a and c), 1 μm (b and d).

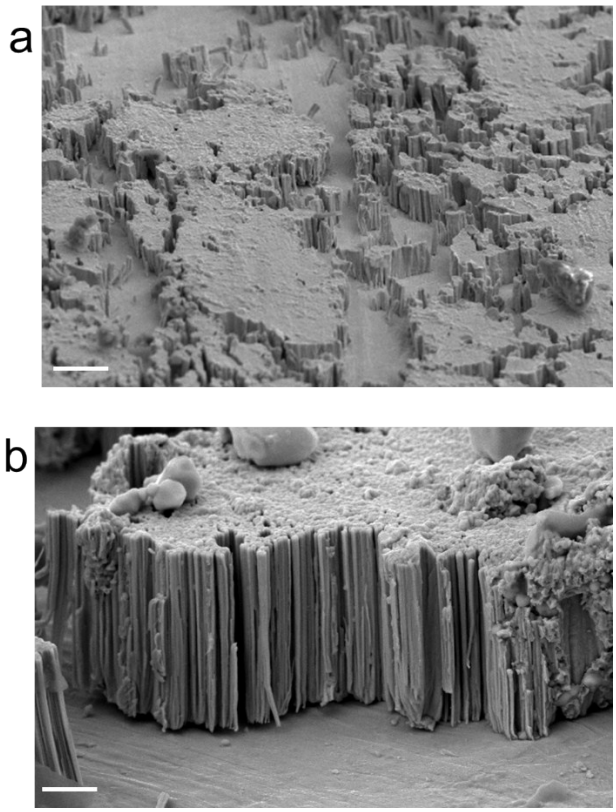

Figure S6 Supplementary SEM pictures of Ag nanowire arrays. a) Freshly grown Ag nanowires at deposition charge density of 2 C/cm^2; b) Ag nanowires at deposition charge density of 10 C/cm^2. Scale bar, 10μm (a), 5 μm (b).

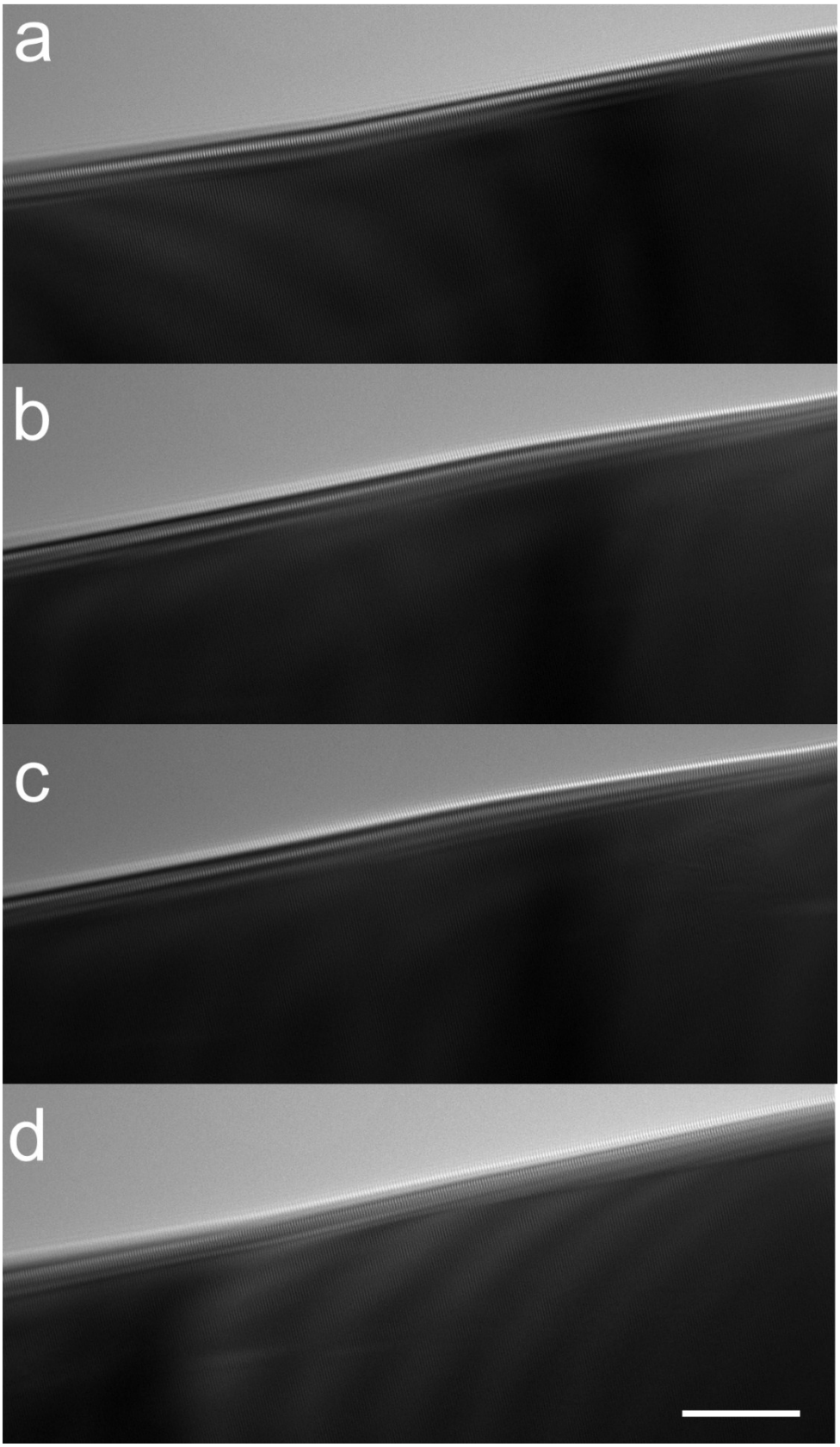

Figure S7. TEM pictures of nanowire margins on different sections (a-d) of a single silver nanowire. Scale bar,10nm.

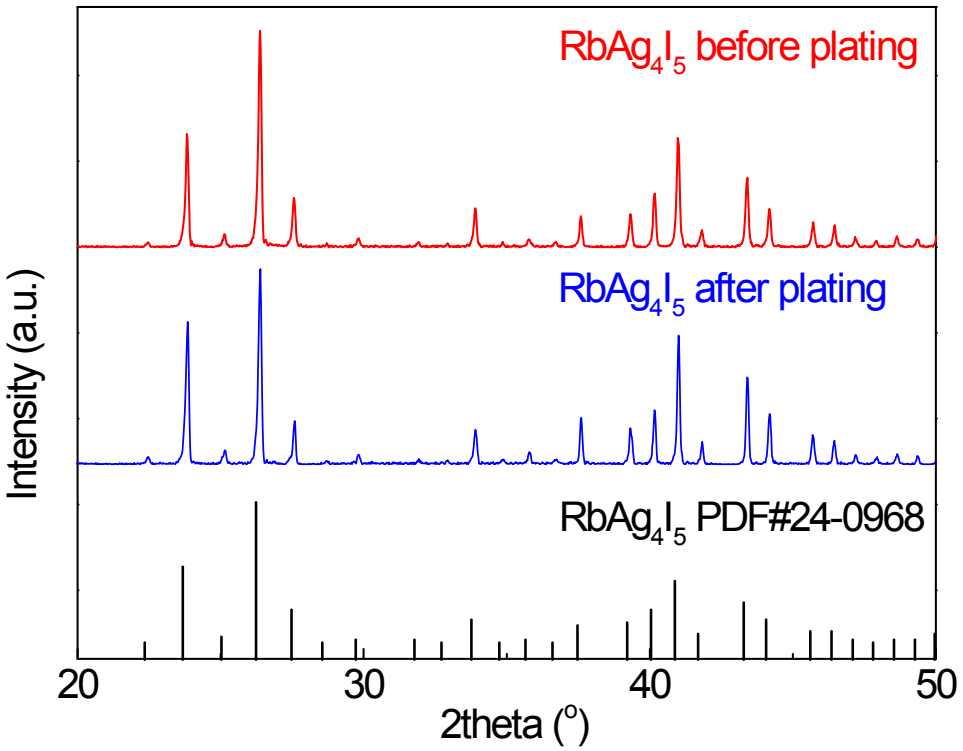

Figure S8. XRD results of the electrolyte before and after all-solid Ag electroplating. The diffraction peaks fits well with standard $RbAg_4I_5$ XRD pattern (ICSD #27203), which indicates that the electrolyte shows no phase transition during electroplating process.

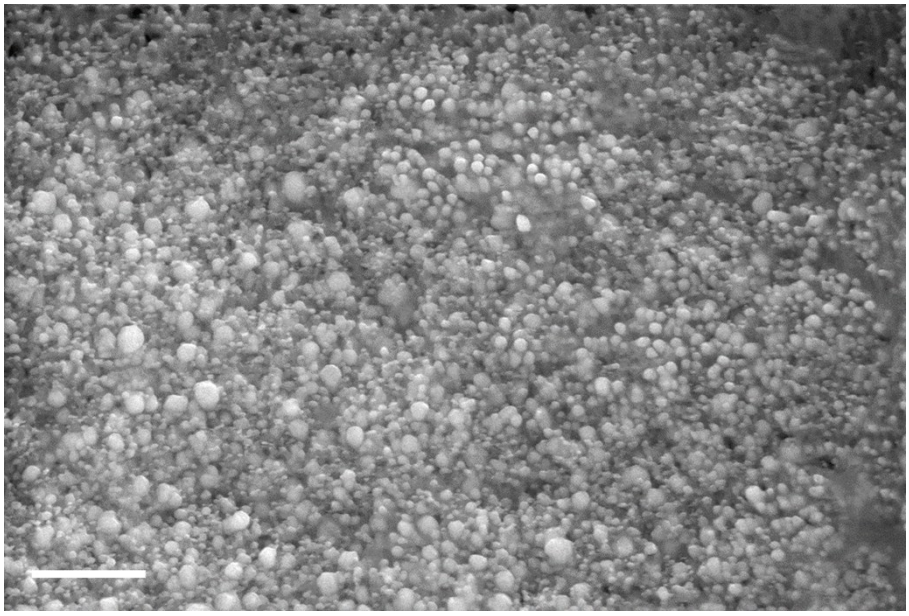

Figure S9. SEM image showing surface morphology deatails of $RbAg_4I_5$ after electroplating. Surface roughness ~100 nm, scale bar, 500 nm.

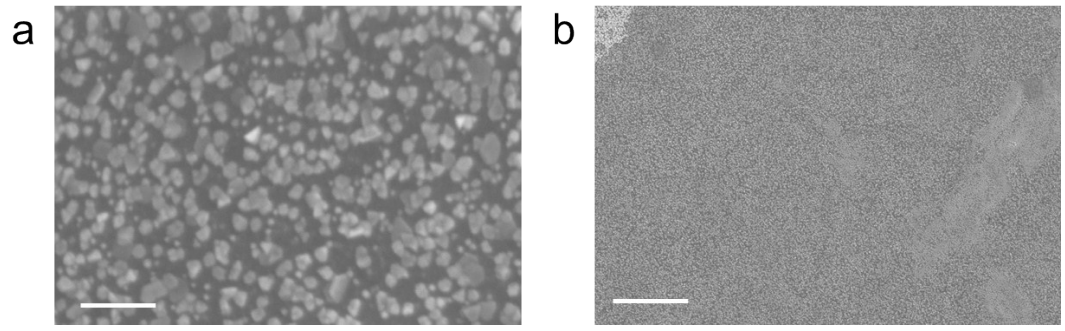

Figure S10. SEM images showing dispersed $RbAg_4I_5$ samples in resin. Scale bar, 1 μm (a), 500 μm (b).