Supporting Information

Light-Reducible Dissipative Nanostructures formed at the Solid−Liquid Interface

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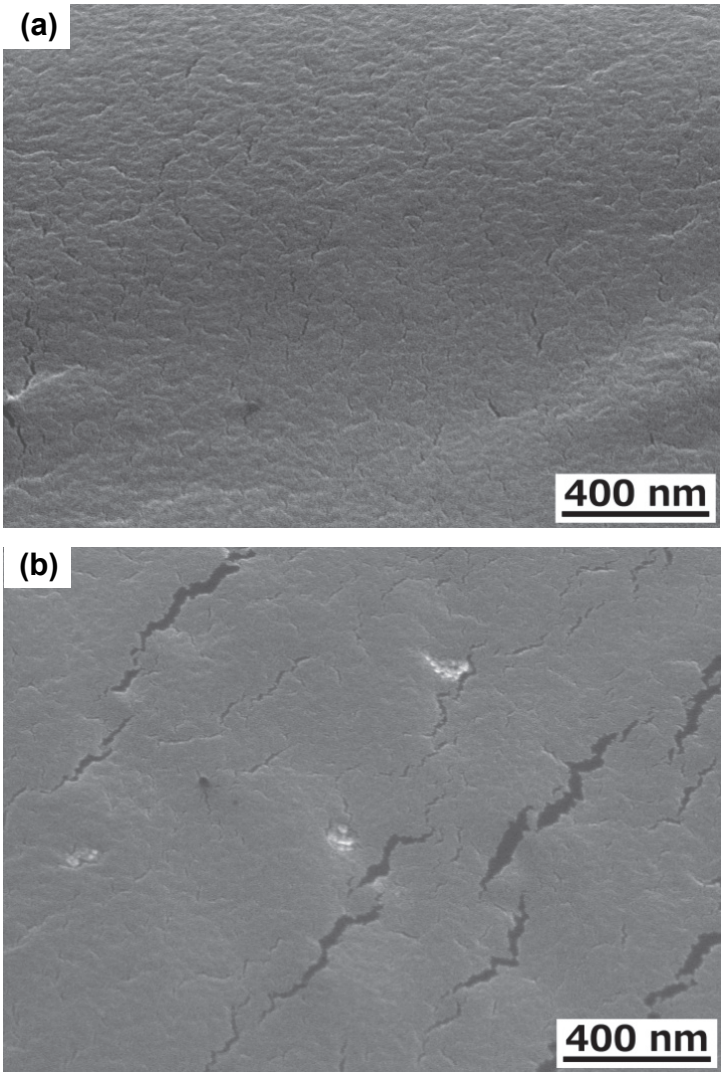

Figure S1. SEM images of the surface of $TBAPF_6$ films formed on Si wafer. (a) As-prepared $TBAPF_6$ film/Si wafer, (b) $TBAPF_6$ film after immersion in $Au(OH)_4^-$ aqueous solution for 30 min under dark condition.

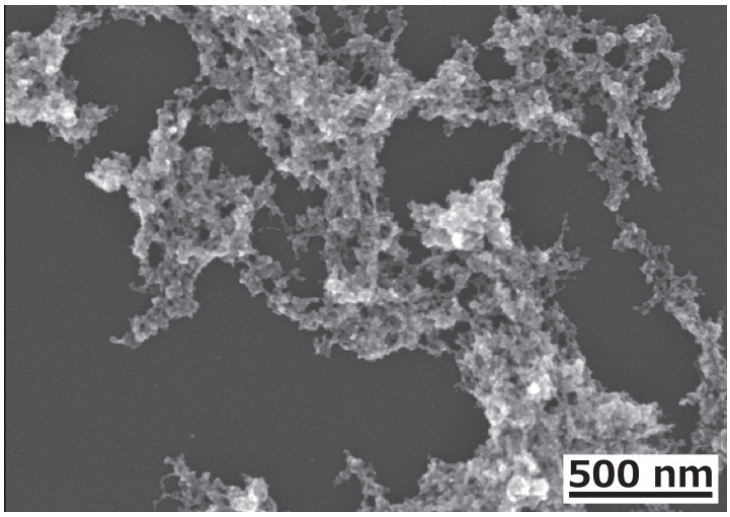

Figure S2. A SEM image of gold nanocrystals deposited on bare Si wafer by photoirradiation of aqueous $Au(OH)_4^-$. A bare Si wafer was immersed in $Au(OH)_4^-$ aqueous solution and the sample was photoilluminated with high pressure mercury lamp for 30 min.

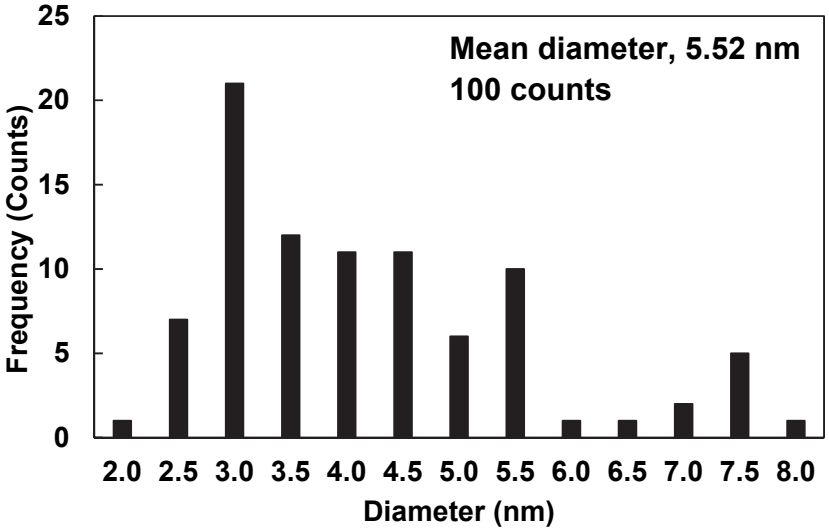

Figure S3. Distribution of the diameter of gold nanowires determined from TEM images (photoillumination period, 30 min).

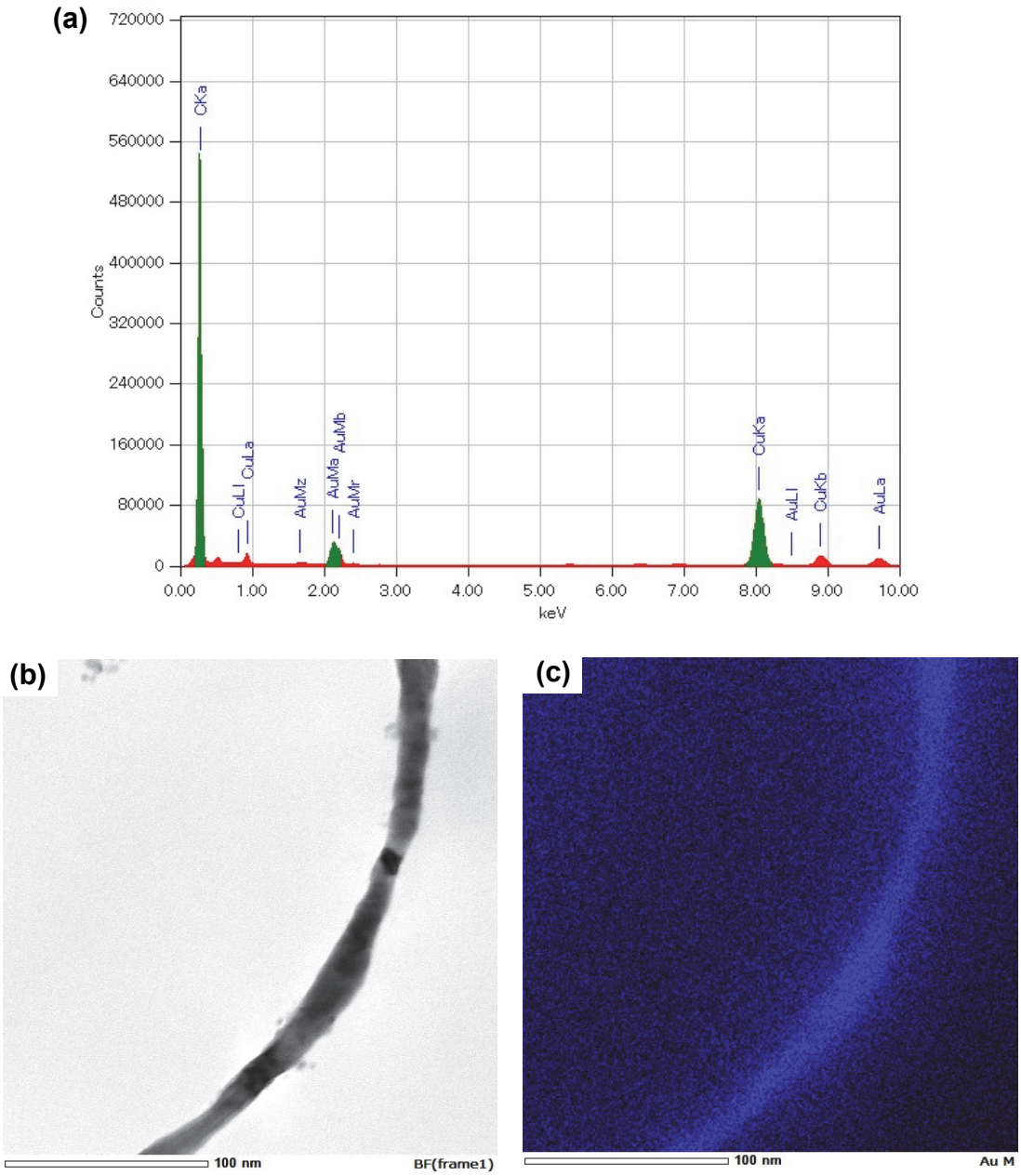

Figure S4. (a) TEM-EDS spectrum of gold nanowires. TEM image (b) and the corresponding elemental mapping (c) of a gold nanowire. The copper, carbon, and other elements in the EDS spectrum are derived from constituent materials of the TEM grid (carbon film on copper grid) and sample stage (Fe, Cr, and Co).

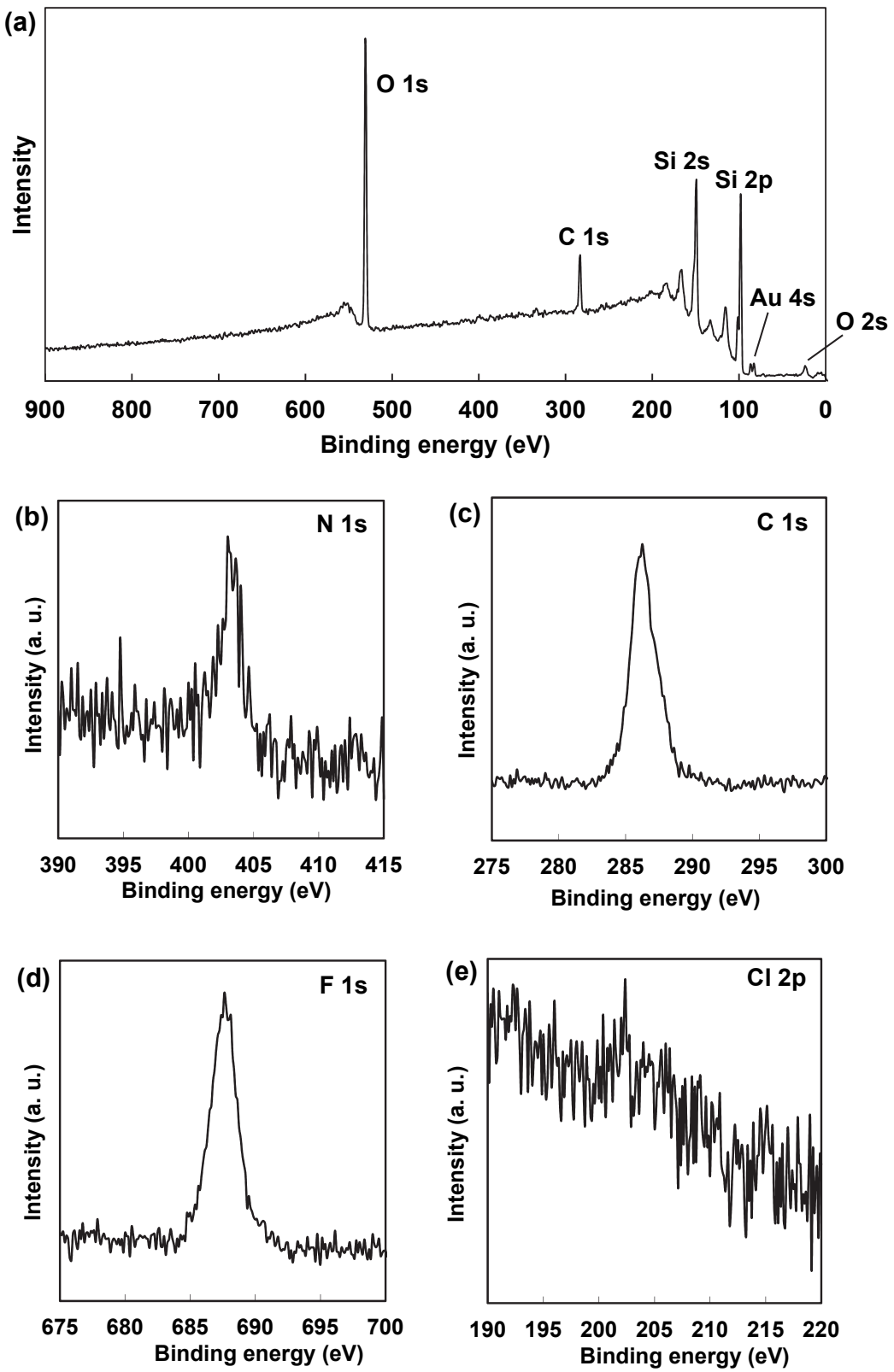

Figure S5. Survey (a) and high resolution (b-e) XPS spectra of gold nanowires deposited Si wafer (photoillumination period, 30 min). The besides gold, Si, O (silicon wafer), nitrogen (b) and fluorine (d)

atoms are observed, which are ascribed to undissolved $TBAPF_6$ remained on the Si wafer. The other elements are those contained in Si wafer.

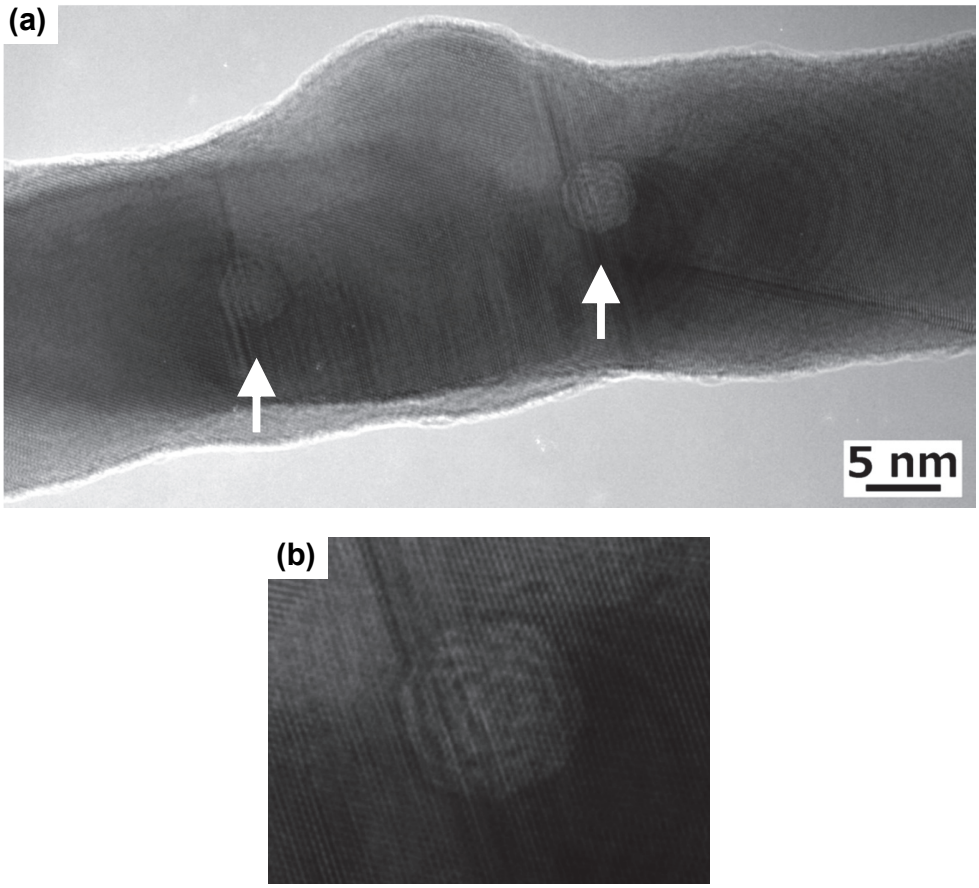

Figure S6. HRTEM (a) and enlarged HRTEM (b) images of gold nanowires formed by photoreduction of linear $TBA[Au(OH)_4^-]$ aggregates. White arrows indicate hollow structures formed at the center of the gold nanowires.

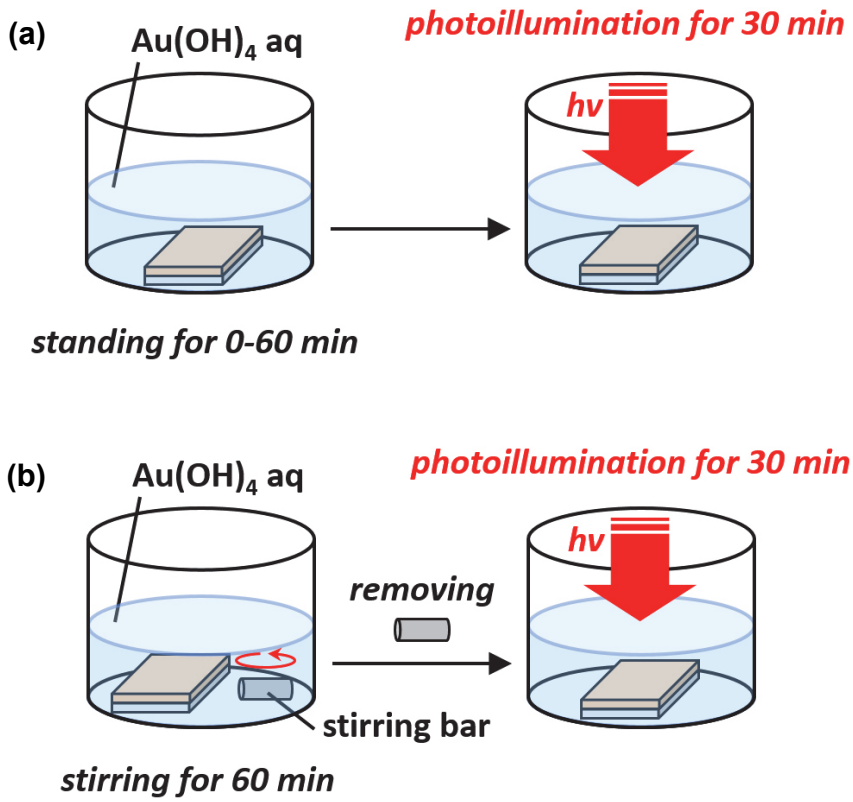

Figure S7. Schematic illustration of the experimental procedures. The $TBAPF_6$/Si wafer in $Au(OH)_4$ aqueous solution were photo-irradiated for 30 min, after the mixtures were allowed to stand for 10–60 min without stirring (a) or for 60 min with stirring (b).

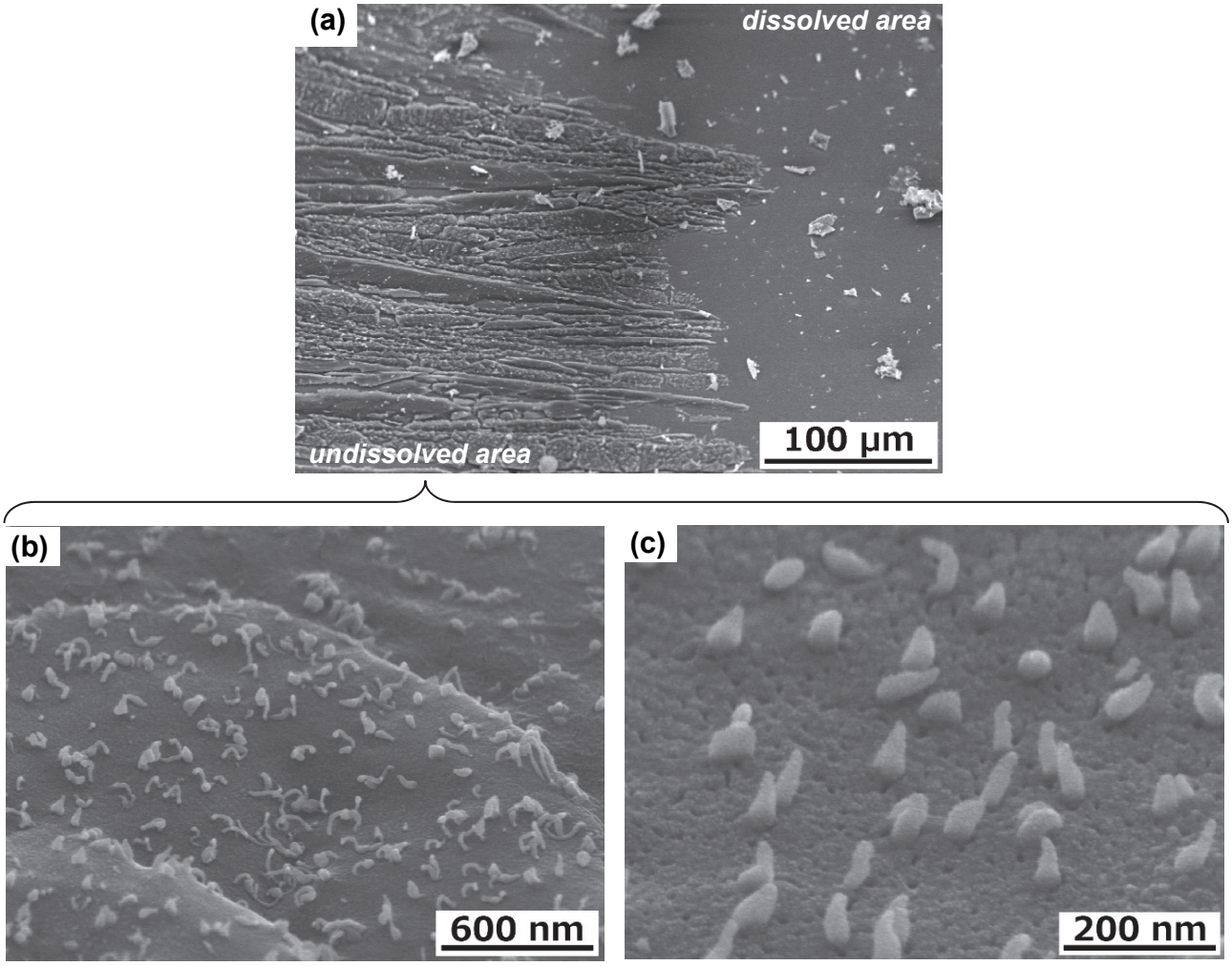

Figure S8. SEM (a) and high resolution SEM (b-c) images of $TBAPF_6$/Si wafer after photoillumination in the aqueous $Au(OH)_4^-$ solution for 1h. Coming out shoots-like gold nanocrystals with thick diameters of 10-20 nm are abundantly seen on the undissolved $TBAPF_6$ film

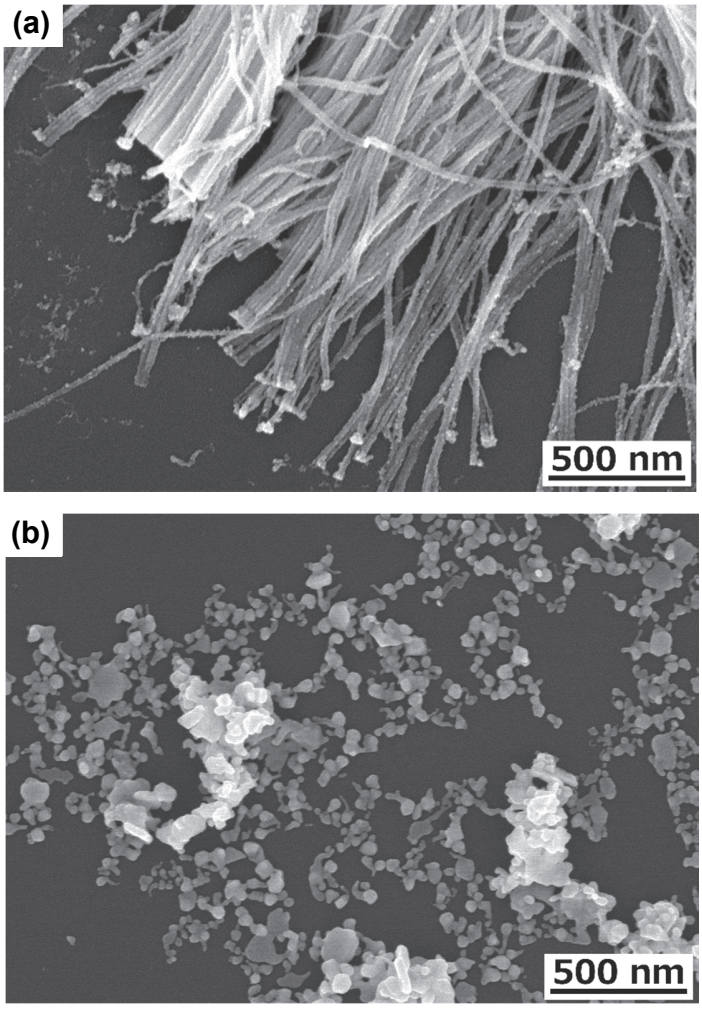

Figure S9. SEM images of gold nanocrystals formed after photoillumination of $TBABF_4$/Si wafer (a) and TBABr/Si wafer (b) immersed in aqueous $Au(OH)_4^-$ solutions.

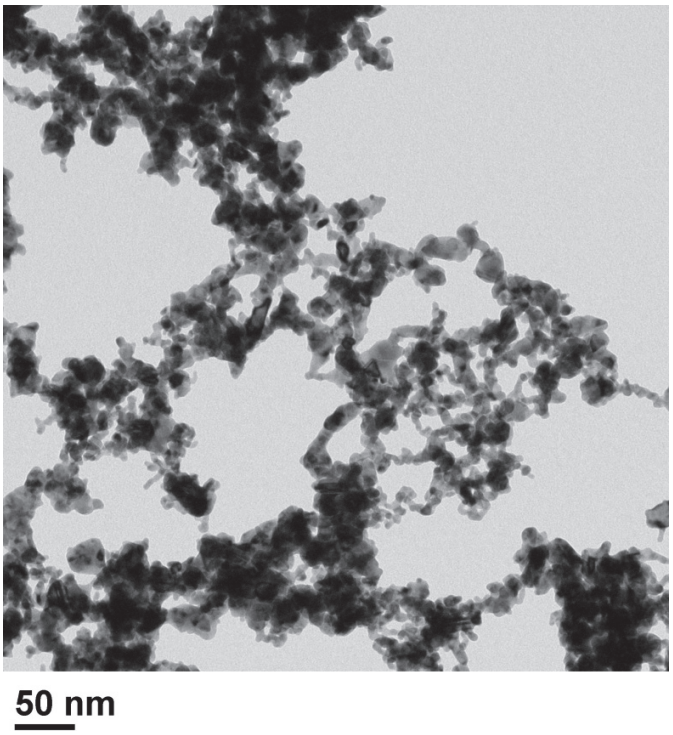

Figure S10. A TEM image of gold nanocrystals obtained by photoillumination of homogeneous aqueous mixture of $TBAPF_6$ (1 mg) and $Au(OH)_4^-$ (3 mL, 21.6 mM). The homogeneous aqueous sample was prepared by sonication and filtered by membrane filter to remove undissolved $TBAPF_6$.