

Supplementary Materials for

The optical duality of tellurium nanoparticles for broadband solar energy harvesting and efficient photothermal conversion

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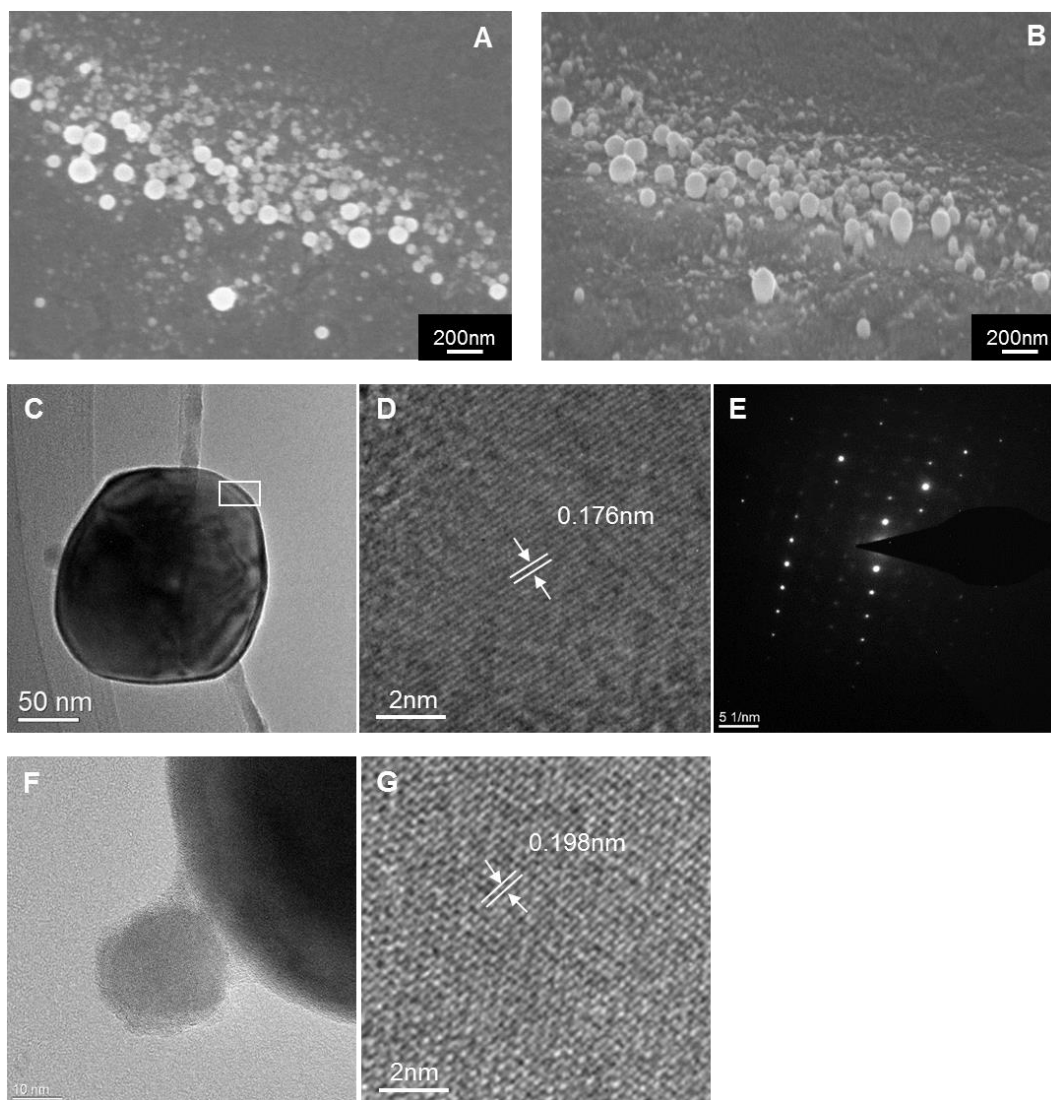


Fig. S1. Typical morphology and structure characterization of Te nanoparticles prepared by ns-LAL. (A) The top SEM image of Te nanoparticles. **(B)** The 54°-tilted SEM image. **(C)** TEM image of a Te nanoparticle (about 200 nm) and its corresponding **(D)** HRTEM micrograph and **(E)** SAED pattern. **(F)** TEM image of a Te nanoparticle (about 25 nm) and its corresponding **(G)** HRTEM micrograph.

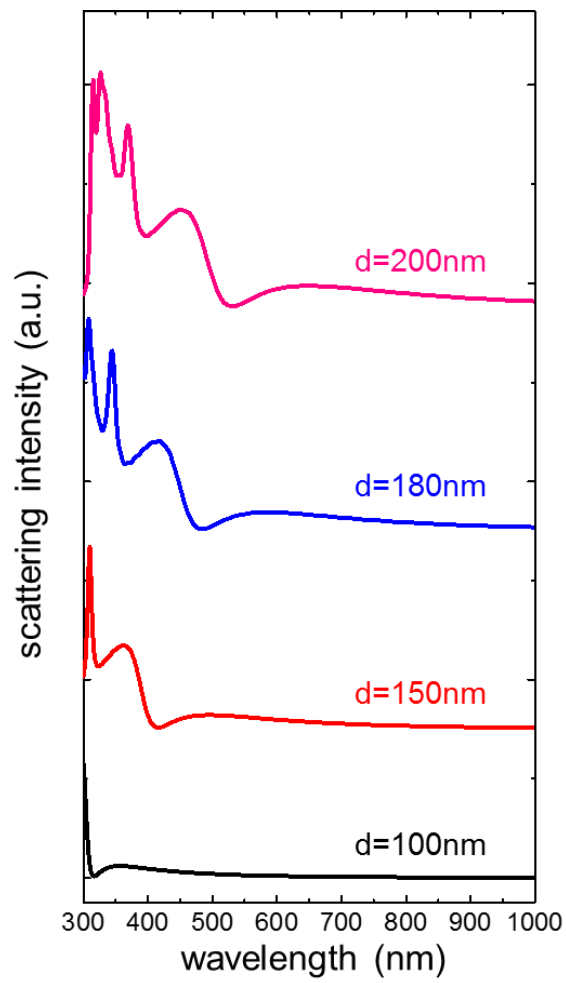


Fig. S2. Scattering spectra of individual TeO₂ nanoparticles. (FDTD simulations).

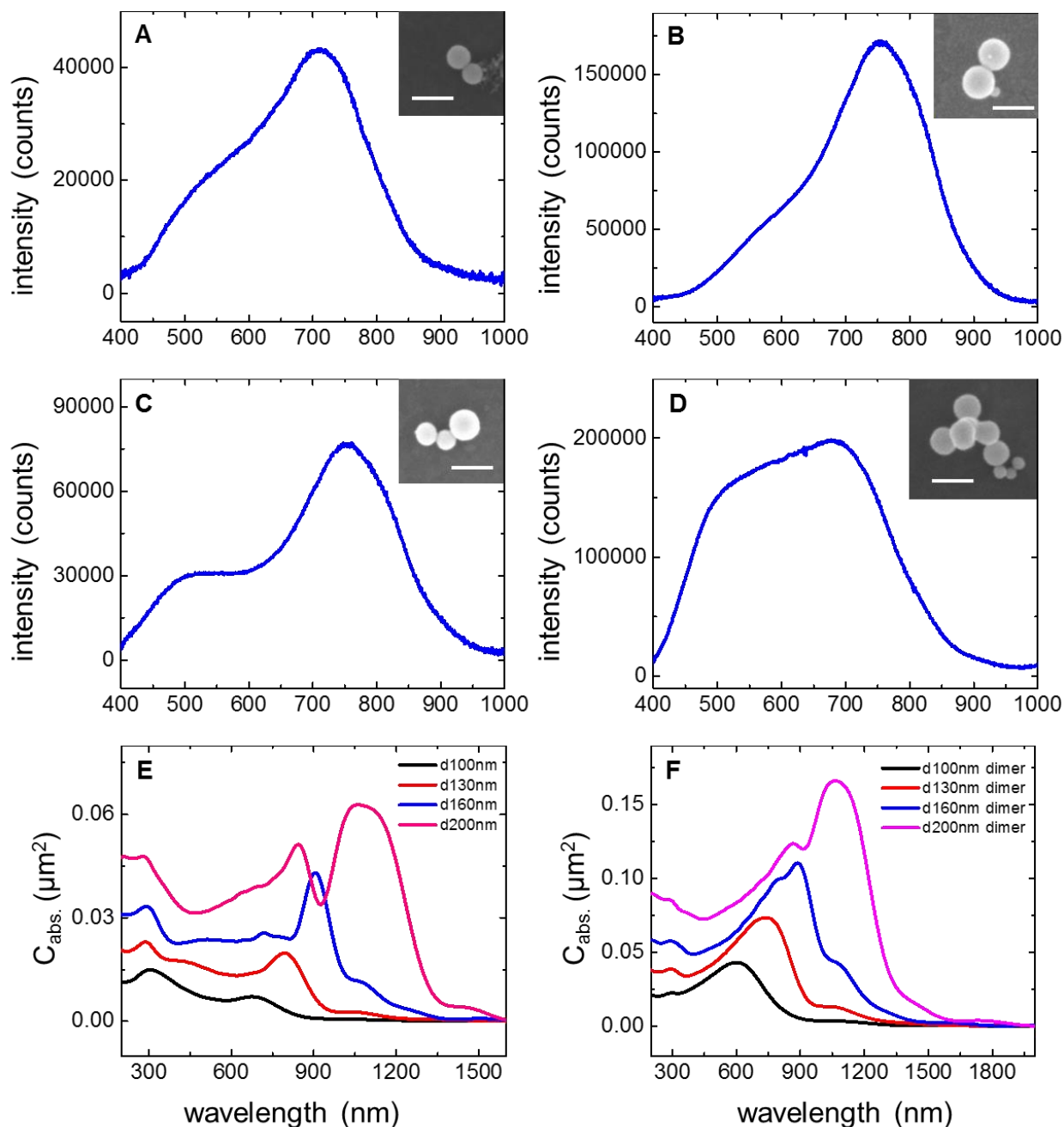


Fig. S3. Scattering and absorption spectra of Te nanoparticle oligomers. The measured backward scattering spectra of Te nanoparticle oligomers with diameters of (A) a dimer: 116.6 & 94.7 nm. (B) a dimer: 150.2 & 150.5 nm. (C) a trimer: 151.0 & 91.5 & 100.6 nm. (D) an oligomer. Insets: The corresponding SEM images of Te nanoparticle oligomer. Scale bar: 200 nm. (E) The absorption cross-section of individual Te nanoparticles ranging from 100 to 200 nm. (F) The absorption cross-section of Te nanoparticle dimers ranging from 100 to 200 nm.

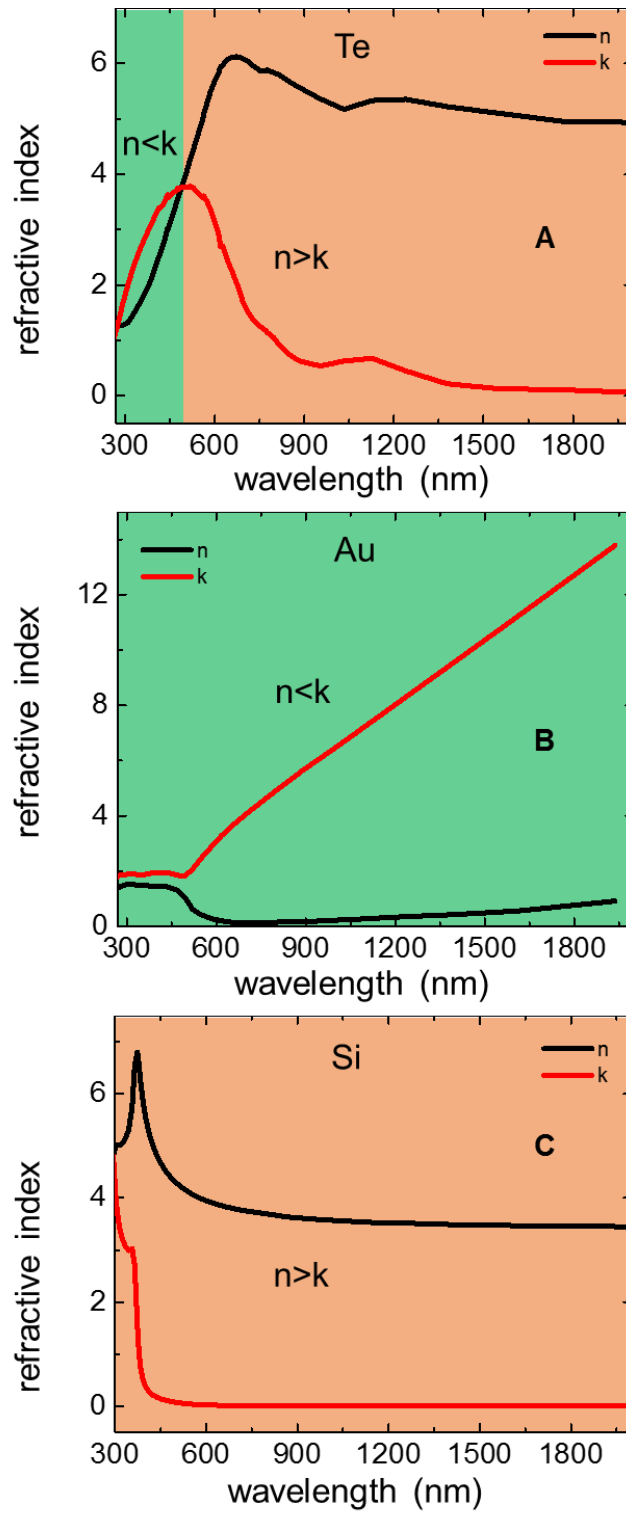


Fig. S4. The real part and imaginary part of the refractive index of Te, Au, and Si. The region 'n < k' is painted in green and the region 'n > k' is painted in orange.

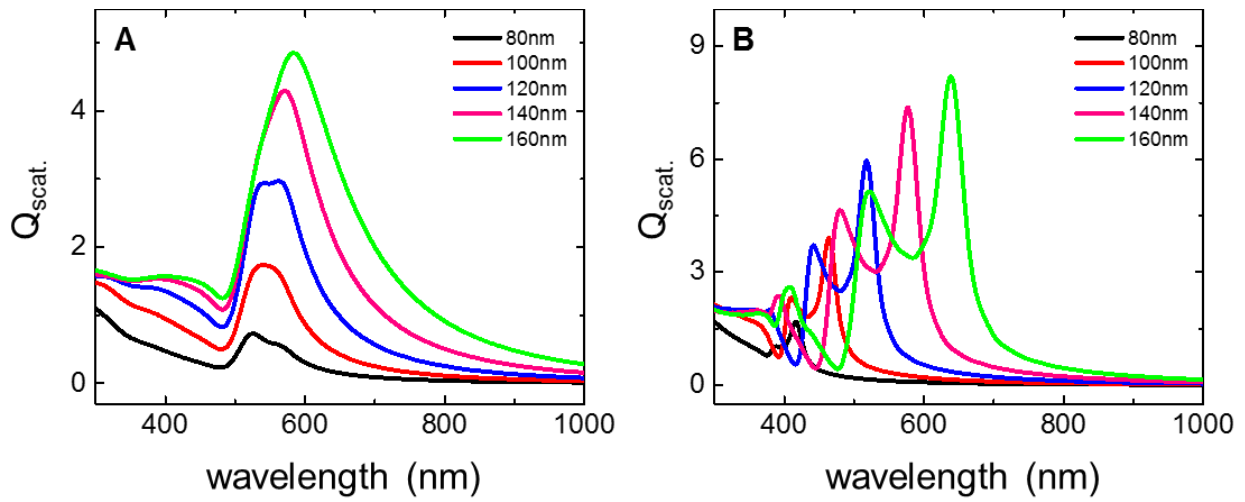


Fig. S5. The scattering spectra of Au nanoparticles and Si nanoparticles. The scattering spectra of (A) Au nanoparticles (a plasmonic material) and (B) Si nanoparticles (a high-index all-dielectric material) with diameters ranging from 80 to 160 nm.

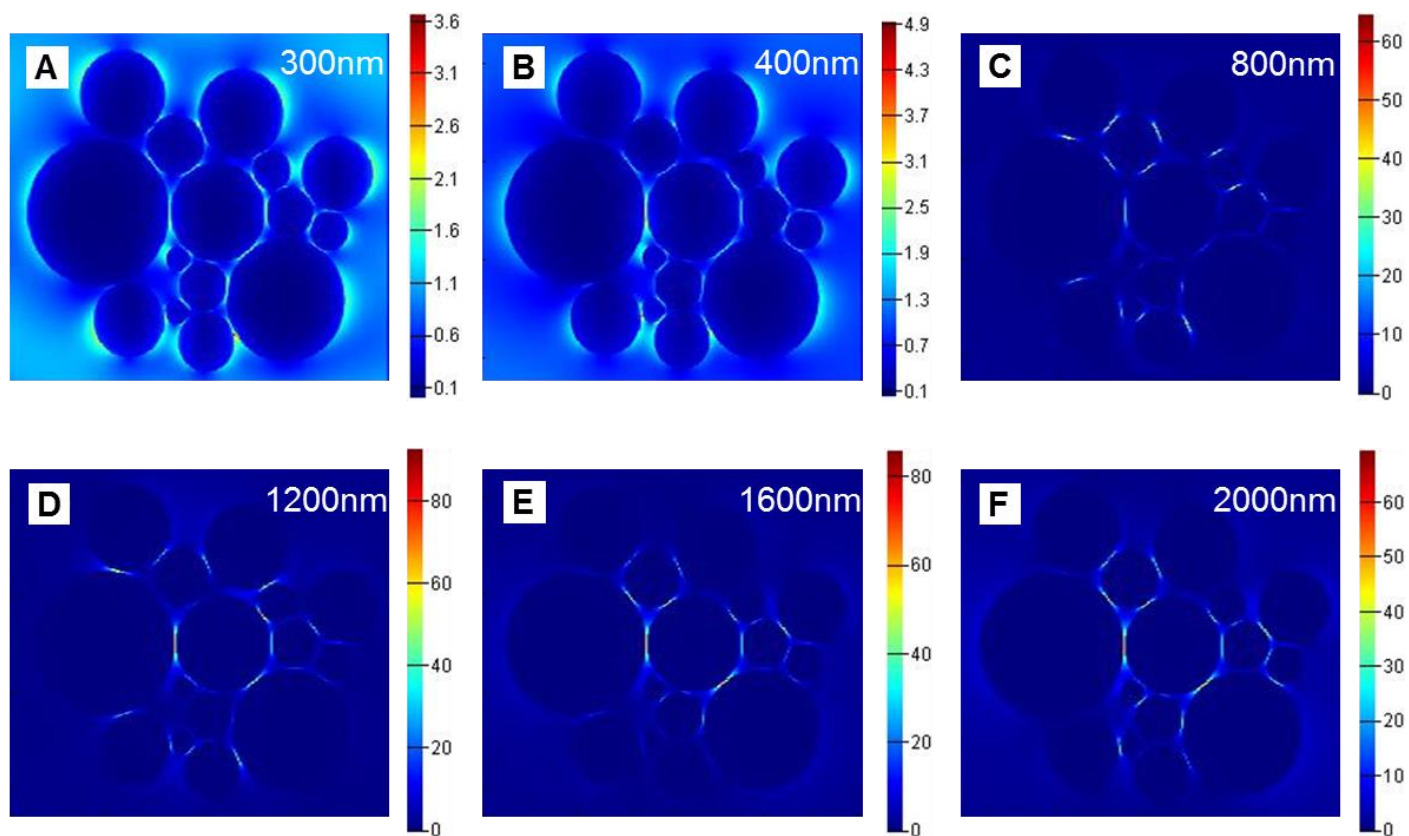


Fig. S6. The electric field enhancements of the Au nanoparticle oligomer. at a broadband range from 300 to 2000 nm.

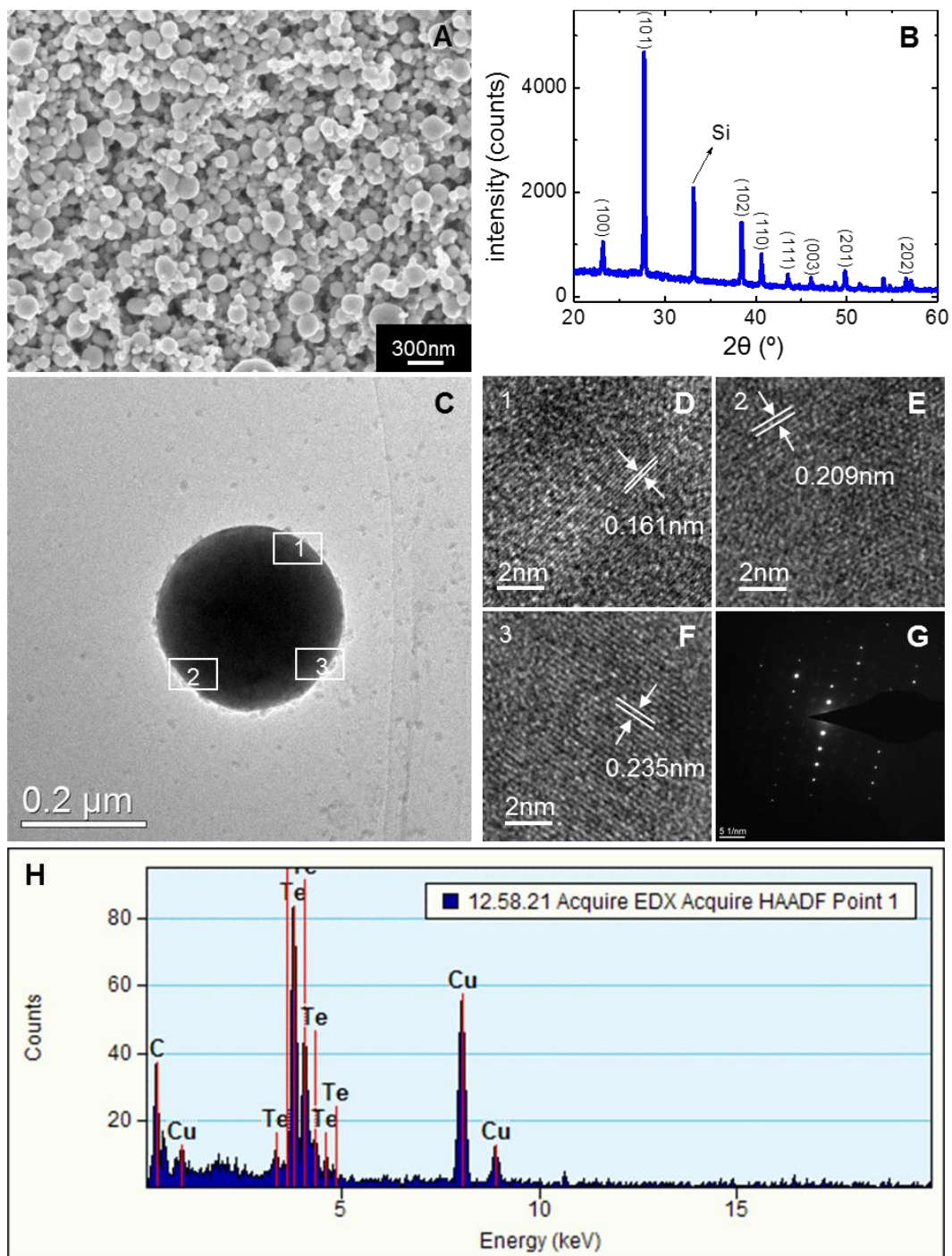


Fig. S7. Typical morphology and structure characterization of Te nanoparticles after working in steam generation for about 2 months. (A) SEM image of Te nanoparticles. (B) XRD pattern of Te nanoparticles deposited on a Si substrate. (C) TEM image of a Te nanoparticle (about 220 nm). (D), (E), (F) The corresponding HRTEM micrographs. (G) The corresponding SAED pattern. (H) The corresponding EDS pattern.

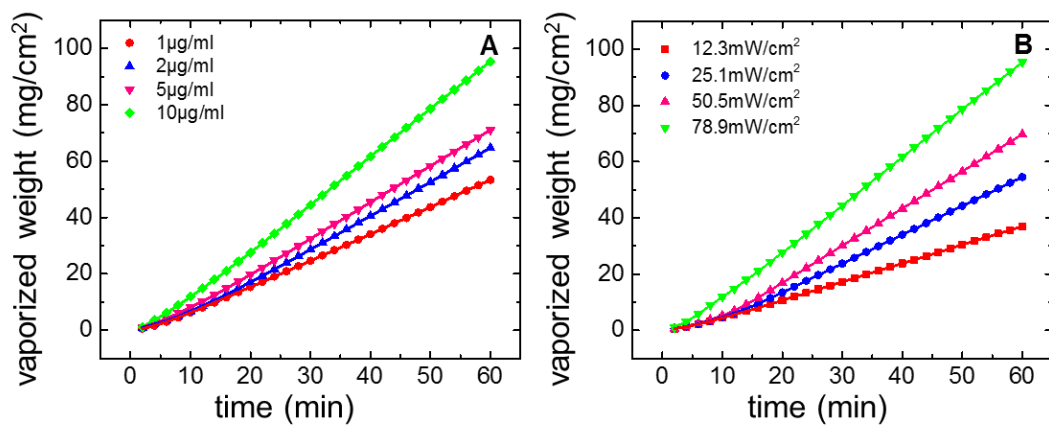


Fig. S8. Water evaporation using Te nanoparticles that have been working in steam generation for about 2 months. (A) Vaporized weight of Te nanoparticle solutions with different concentrations under the illumination of simulated sunlight at 78.9 mW/cm². **(B)** Vaporized weight of Te nanoparticle solutions (10 µg/ml) under different illumination of simulated sunlight.

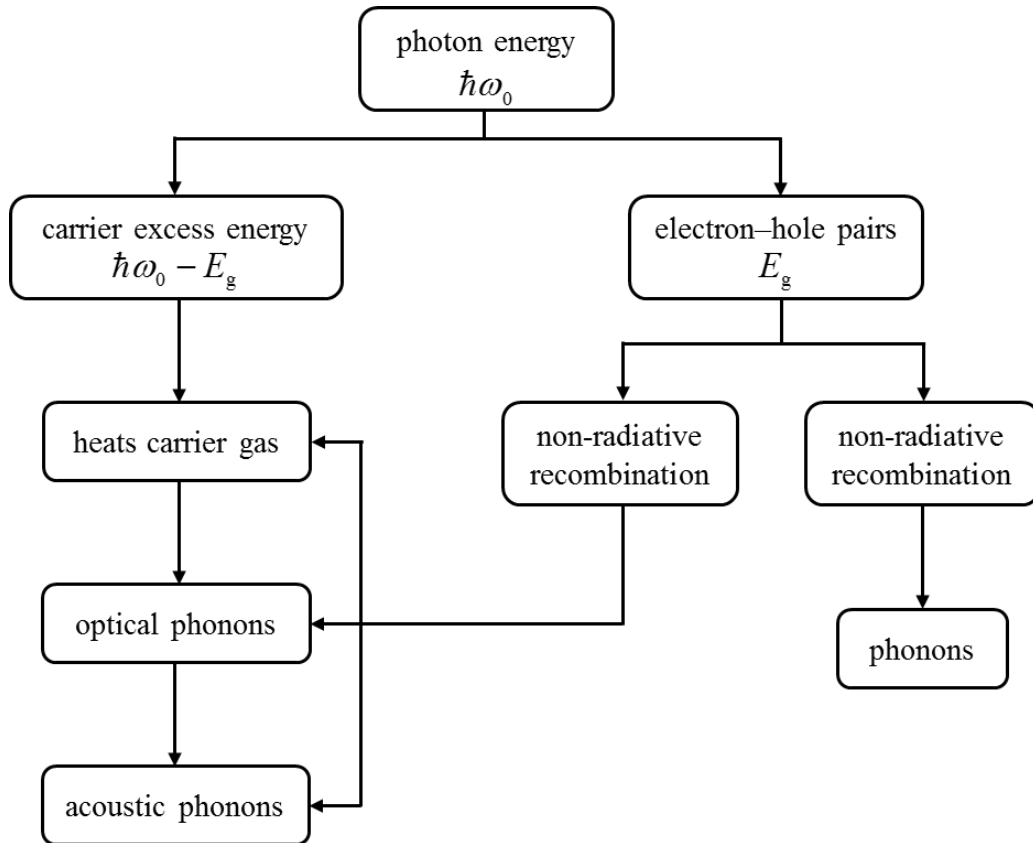


Fig. S9. An intuitive diagram illustrating the flow of energy in a photoexcited semiconductor.