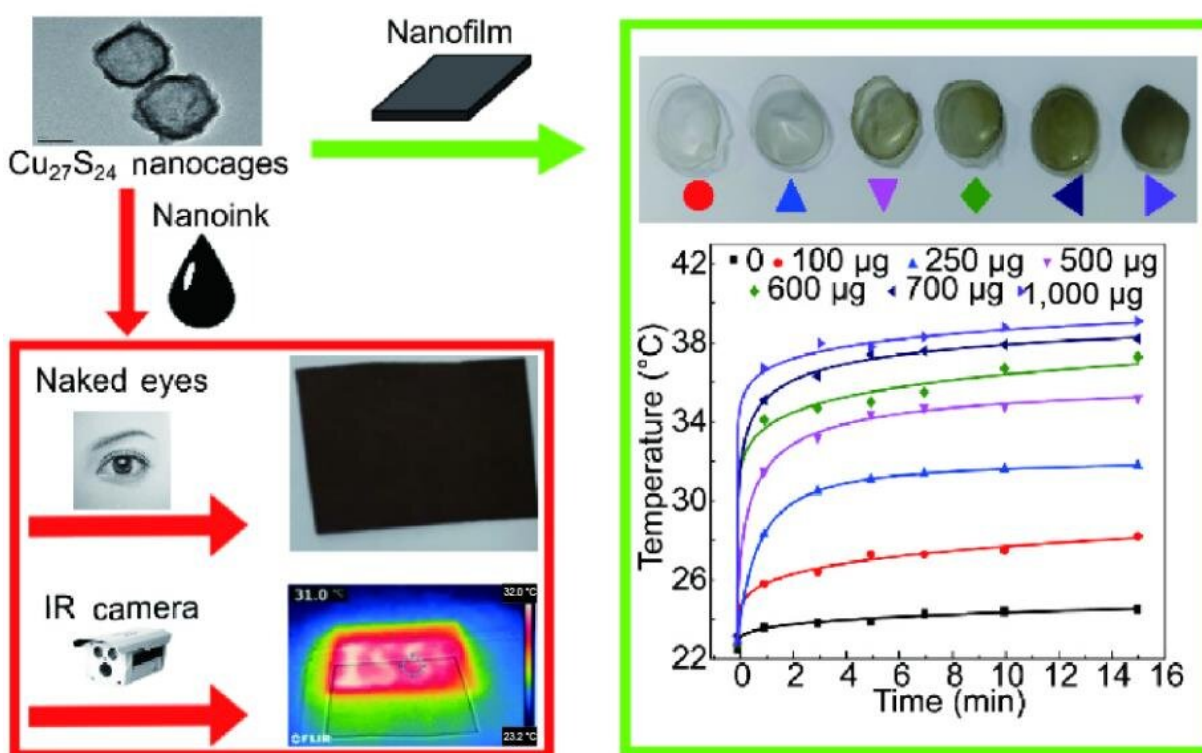


Novel plasmonic solar thermal materials developed to reserve sun heat

November 5 2021, by Xi Min, Zhao Weiwei



$\text{Cu}_{27}\text{S}_{24}$ nanocage was synthesized and evaluated by a combination of experimental measurement and theoretical calculation. And the developed $\text{Cu}_{27}\text{S}_{24}$ "nanoink" and "nanofilm" showed high efficient photothermal performance. Credit: XI Min

Recently, researchers developed high-performance solar thermal copper

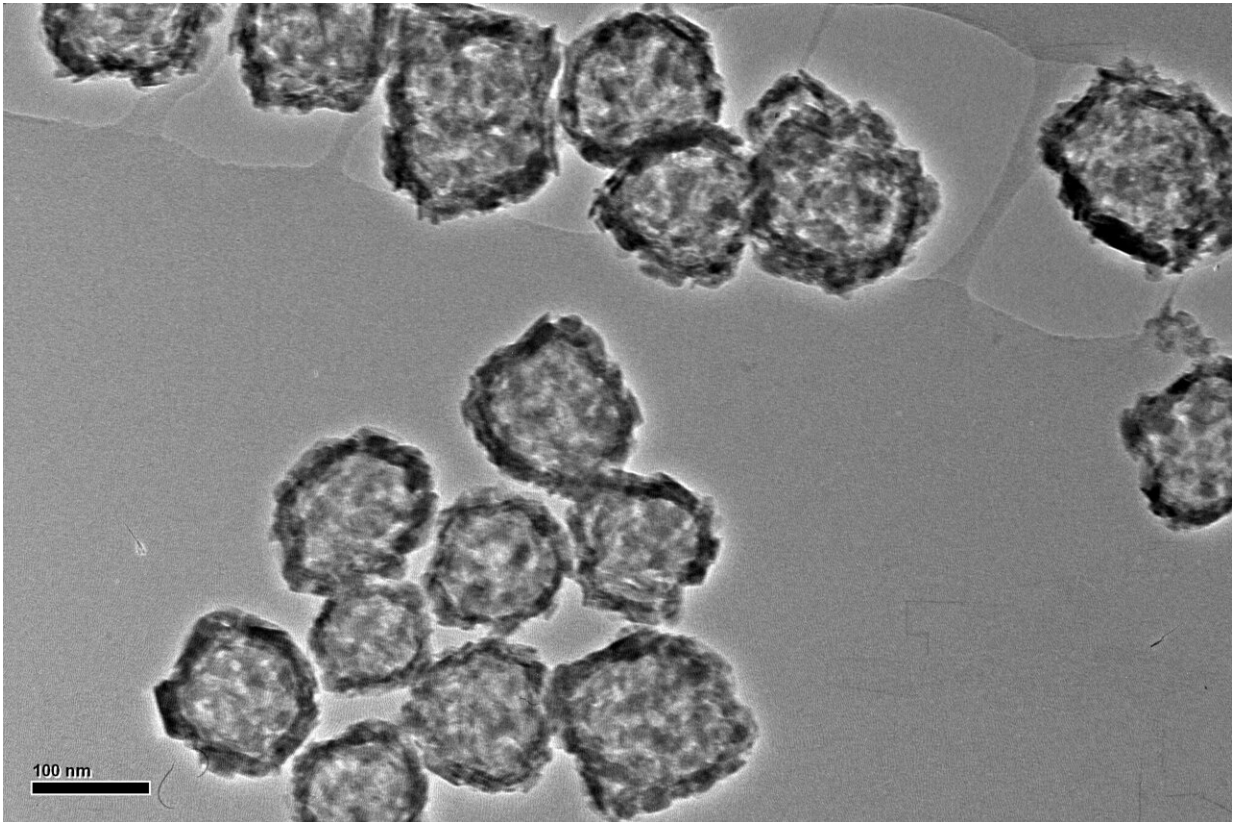
sulfide photothermal ink and photothermal film, marking big progress in the field of Plasmonic Solar photothermal Materials.

The team was led by Prof. Wang Zhenyang from the Institute of Solid State Physics, Hefei Institutes of physical science, Chinese Academy of Sciences. The relevant results were published on *Nano Research*.

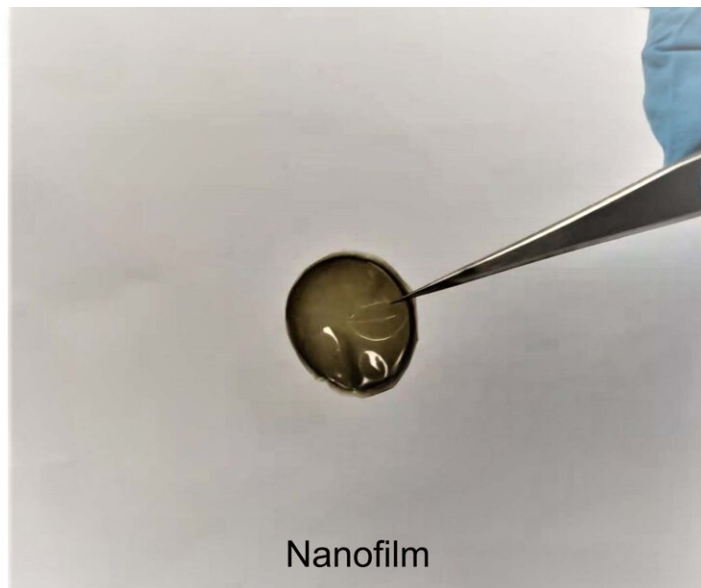
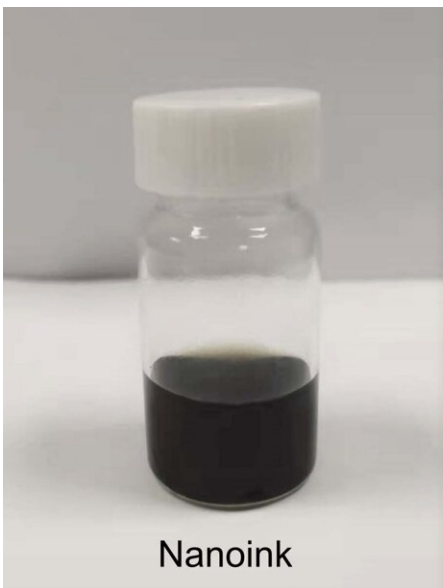
Scientists have been seeking strategies to achieve high efficient solar energy utilization for various applications, such as: [solar water heaters](#), energy-saving buildings, drying systems and other fields.

In this study, researchers used the Kirkendall reaction to synthesize hollow copper sulfide ($\text{Cu}_{27}\text{S}_{24}$) nanocages. Compared to traditional noble metal plasmonic nanomaterials (gold or silver), which shows plasmon [photothermal](#) phenomena given the condition of illumination with visible light, $\text{Cu}_{27}\text{S}_{24}$ nanocages as semiconducting material that have lower interband transition and scattering loss. Besides, the hollow [nanocage](#) structure can further expand the available light harvesting range and further improve the light-to-heat conversion efficiency.

The researchers combined first-principles calculations and finite element method (FEM) simulations to fit the optical properties of the nanocage, and predicted its excellent solar photothermal performance. Based on the evaluation results, solar photothermal nanoink and nanofilm were further developed. This work preliminarily proves that the hollow [copper](#) sulfide nanocage has broad prospects in plasmonic photothermal applications.



Novel plasmonic solar thermal materials developed to reserve Sun heat. Credit: XI Min



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More information: Min Xi et al, Plasmonic Cu₂S₂₄ nanocages for novel solar photothermal nanoink and nanofilm, *Nano Research* (2021).
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