



NIR-Absorbing Mesoporous Silica-Coated Copper Sulphide Nanostructures for Light-to-Thermal Energy Conversion

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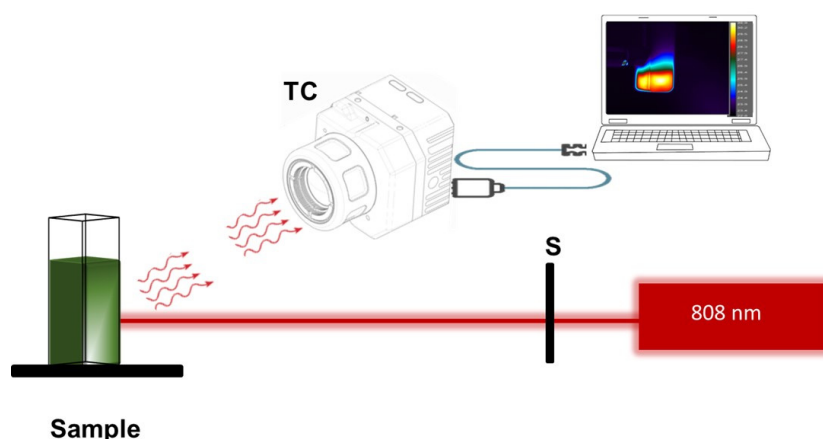


Figure S1. Sketch of the optical set-up used for the photothermal investigation. A quartz cuvette (Sample) filled with the samples (1 mL) was irradiated with CW diode laser light emitting at 808 nm. The laser beam is activated by an optical shutters (S). The spatial-temporal temperature profiles are detected with a high-resolution thermal camera (TC).

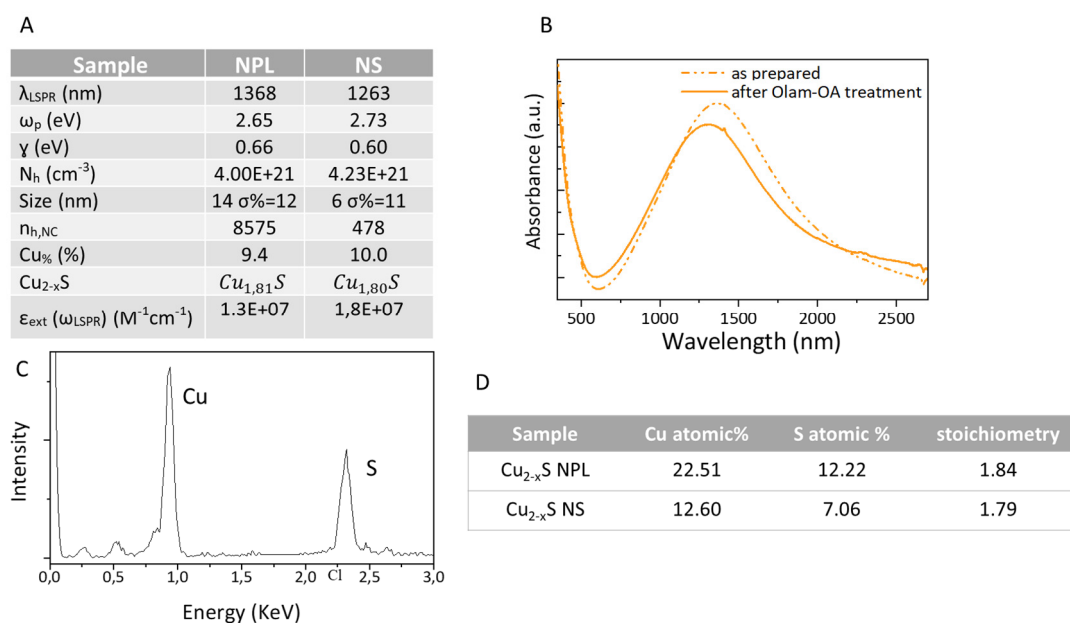


Figure S2. (A) Table of the plasmonic features as λ_{LSPR} (maximum wavelength of the LSPR band), γ (full width at half maximum), determined from the UV-Vis NIR absorbance spectra, ω_p (bulk plasmon band), N_h (hole carrier density) and ϵ_{ext} (extinction coefficient) as well as copper deficiency, theoretically determined adopting the Mie Theory; (B) UV-Vis-NIR absorbance spectra of the Cu_{2-x}S nanoplate (NPL) colloidal solution before and after the treatment with fresh ligands Oleyl amine (Olam) and oleic acid (OA); (C, D) Energy Dispersive X-ray (EDX) spectrum of Cu_{2-x}S nanocrystals and table reporting the atomic percentage of copper and sulphur and the corresponding stoichiometry for Cu_{2-x}S NPL and spherical nanoparticles (NS) colloidal solution drop casted on silicon substrate, as measured by EDX analysis.

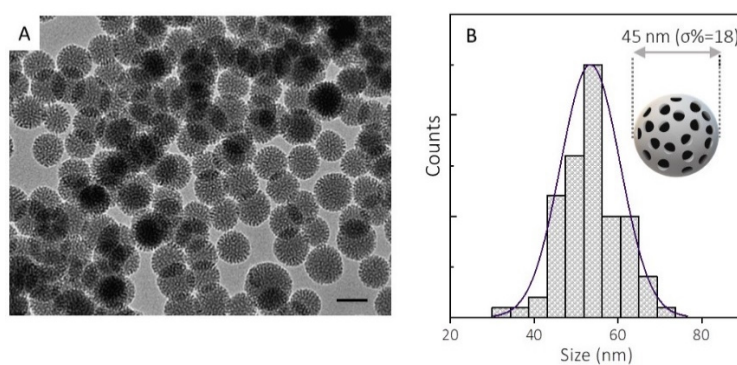


Figure S3. TEM micrograph (A, scale bar 50 nm) and statistical analysis (B) of the diameters of mesoporous nanoparticles (MSN).

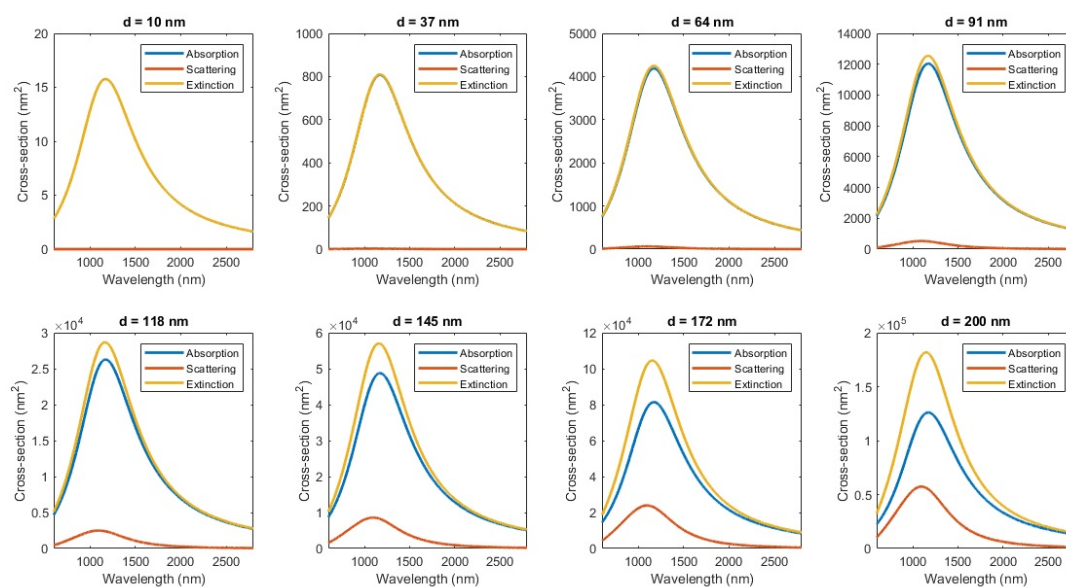


Figure S4. Computational estimation of the scattering (red line), absorption (blue line) and extinction (yellow line) cross-section contribution depending on the plasmonic NC diameter, d . The scattering cross section starts to become relevant for NC diameter up to ninety nm, while below this threshold size the main contribution to the extinction cross section comes from the absorption.

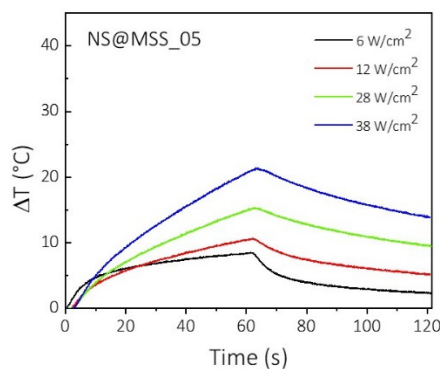


Figure S5. Heating/cooling curves reporting the temperature increase versus time for NS@MSS_05

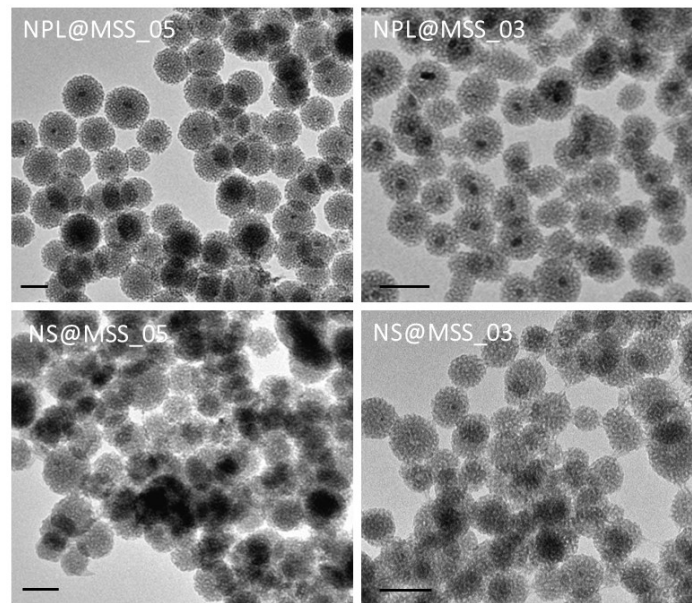


Figure S6. TEM micrographs (scale bar 50 nm) of core-shell structures NPL@MSS_05, NPL@MSS_03, NS@MSS_05, NS@MSS_03 after irradiation with a CW laser beam at 808 nm at increasing power density.

$$\theta = \frac{T(t) - T_{sur}}{T_{max} - T_{sur}} \quad -\ln\theta = \frac{t}{\tau}$$

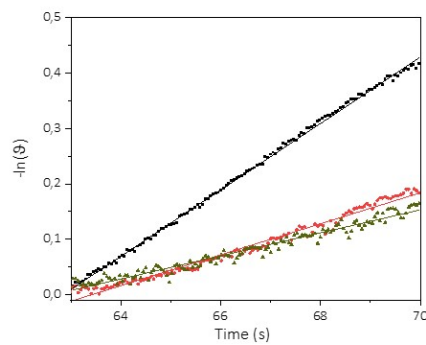


Figure S7. Plot of the negative reciprocal slope of $\ln(\theta)$ versus t using temperature versus time data recorded during cooling after the CW laser beam 808 nm switched off (power density 6 W/cm²) for NPL@MSS_05 (black line), NPL@MSS_03 (red line) and NS@MSS_03 (green line).