Supporting Information

Temperature Regulation Growth of Au Nanocrystals: from Concave Trisoctahedron to Dendritic Structures and Their Ultrasensitive SERS-based Detection of Lindane

Xia Zhou\textsuperscript{a,b,c}, Qian Zhao\textsuperscript{a,b}, Guangqiang Liu \textsuperscript{a*}, Hongwen Zhang\textsuperscript{a}, Yue Li\textsuperscript{a}, and Weiping Cai\textsuperscript{a,b*}

\textsuperscript{a}Key Lab of Materials Physics, Anhui Key Lab of Nanomaterials and Nanotechnology, Institute of Solid State Physics, Chinese Academy of Sciences, Hefei 230031, PR China
\textsuperscript{b}University of Science and Technology of China, Hefei 230026, PR China
\textsuperscript{c}Anhui Key Laboratory of Spin Electron and Nanomaterials, School of Chemistry and Chemical Engineering, Suzhou University, Suzhou, Anhui 234000, PR China

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{FigureS1.png}
\caption{The XRD patterns of the products obtained by addition of Au seed solution with 0.05mL at different reaction temperatures.}
\end{figure}

* To whom all correspondence should be addressed
E-mail: liugg@issp.ac.cn, wpcai@issp.ac.cn; Tel: +86-551-65592747; Fax: +86-551-65591434
Figure S2. Optical absorbance spectra of Au colloidal solutions obtained by addition of different Au seeds solution amounts (0.10 mL, 0.05 mL, 0.025 mL, 0.01 mL) at 25°C, respectively.
Figure S3. (a–d): SEM images of products obtained by addition of Au seeds solution amounts 0.10 mL, 0.05 mL, 0.025 mL and 0.01 mL, respectively, at 25°C. (e): The size distribution histograms of the particles. The frames from top to bottom: correspond to the samples in panels a–d, respectively.
Figure S4. The SEM images of the products obtained by addition of Au seeds solution with 0.05mL at different reaction temperatures. (a): 40 °C, (b): 60 °C, (c): 80 °C, (d): 100 °C.
Figure S5. The SEM images of the Au nanocrystals obtained at 20°C by addition of Au seeds solution amounts (a): 0.10 mL, (b): 0.05mL, (c): 0.025mL and (d): 0.01 mL.
Figure S6. The SEM images of the Au nanocrystals obtained at 10°C by addition of Au seeds solution amounts (a): 0.10 mL, (b): 0.05mL, (c): 0.025mL and (d): 0.01 mL.
Figure S7. The SEM images of the Au nanocrystals obtained at 5°C by addition of Au seeds solution amounts (a): 0.10 mL, (b): 0.05mL, (c): 0.025mL and (d): 0.01 mL.
Figure S8. SEM images of the films built of the Au nanocrystals obtained by addition of 0.05 mL seeds solution at different reaction temperatures. (a): 25°C, (b): 20°C, (c): 10°C, (d): 5°C.
Figure S9. The Raman spectra from the 20 random spots on the films built of the nanocrystals obtained at (a) 25°C, (b) 20°C, (c) 10°C, (d) 5°C, after soaking in the solution with 10⁻⁶ M in lindane concentration. (excited at 785nm)
Figure S10. The intensity of the main peak at 345 cm$^{-1}$ from each spots on the Au nanocrystals-built films. The data in (a-d) are from (a), (b), (c) and (d) in Figure S10, respectively.
Figure S11. The SEM images of the Au concave trisoctahedral nanocrystals-built films with (a) 200 nm, (b) 500 nm and (c) 800 nm in thickness. (d): The Raman spectra of the lindane molecules on these films after soaking in the solution with $10^{-6}$M in lindane concentration and drying. (excited at 785 nm).
Figure S12. The Raman spectra of the lindane molecules on the Au concave trisoctahedral nanocrystals-built film after soaking in the lindane solution with $10^{-6}$M, excited at different wavelengths. Curve (I): 785 nm; Curve (II): 633 nm; Curve (III): 532 nm.
**Figure S13.** Raman spectra of the lindane molecules by dropping (a): 20μL lindane solution (10^{-5} M) on the films built of the Au nanocrystals obtained at different reaction temperatures and (b): 50μL lindane solution (0.1M) on Si wafer, and drying.