

1 Regents and Apparatus

Chlorpyrifos ($\geq 99.4\%$) was purchased from Sigma-Aldrich Chemical (St Louis, Mo, USA). Trisodium citrate ($\text{Na}_3\text{C}_6\text{H}_5\text{-O}_7$, $\geq 99.0\%$), magnesium sulfate anhydrous (MgSO_4 , $\geq 98.0\%$), Chloroauric acid tetrahydrate ($\text{HAuCl}_4\cdot 4\text{H}_2\text{O}$, $\text{Au} \geq 47.8\%$), sodium chloride (NaCl , $\geq 99.5\%$), Sodium acetate anhydrous ($\text{C}_2\text{H}_3\text{NaO}_2$, $\geq 99.0\%$), acetonitrile (ACE, analytical pure), were obtained from Sinopharm Chemical Reagents Co., Ltd. (Shanghai, China). Fe_3O_4 magnetic nanoparticles ($\text{Fe}_3\text{O}_4\text{MNPs}$, 100 nm) were obtained from Hangzhou Wanjing New Material Co., Ltd (Hangzhou, China). Negative citrus samples were provided by Jiangxi Entry-Exit Inspection and Quarantine Bureau. Nano-bamboo charcoal (NBC, 100 nm) was bought from Shanghai Hainuo Carbon Industry Co., Ltd (Shanghai, China).

Raman spectrum were gathered by a RamTracer-200-HS Portable laser Raman spectrometer (Optus Opto Trace TechnoLogies, Inc), using a diode steady stimulator at 785 nm excitation wavelength with optical resolution $< 6\text{cm}^{-1}$, 400mW laser power, spectral scanning range of 100 ~ 3300 cm^{-1} , and integration time for the collection of the spectra of 10s. Intelligent thermostatic magnetic stirrer (Yarong company, Zhengzhou, China) was applied to prepare AuNPs. AuNPs structure analysis was performed based on scanning electron microscopy (SEM; EDAX Corporation, USA), transmission electron microscope (TEM, JEOL Company, Japan) and UV-visible absorption spectroscopy (Beijing Puxi General Instrument Co., Ltd, China). Mixing of samples used a vortex mixer (Qilin Bell Instruments Co., Ltd., Haimen, China) Centrifuge (Jiawen, Instrument Equipmen, Anhui, Chinat) was used for citrus sample

processing.

Table S1 Orthogonal test-level encoding table

levels	Factor		
	AuNPs (μL)	Test solution (μL)	NaCl concentration (%)
1	300	30	0.5
2	400	40	1.0
3	500	50	1.5