**Supporting Information**

# Three-Dimensional Homogeneous Ferrite-Carbon Aerogel: One Pot Fabrication and Enhanced Electro-Fenton Reactivity

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Contents: One Text (Text S1) and seven figures (Figure S1-S7)

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**Text S1.**

For studying the catalytic performance to decompose $H_2O_2$ of 5 wt% FCA, a series of heterogeneous Fenton oxidation with adding a dose of $H_2O_2$ (5 mM) are performed, including the changes of accumulated •OH concentration and metalaxyl TOC removal with reaction time in a Fenton system (no potential is applied). As shown in Figure S3, when the $H_2O_2$ solution is added to FCA, the strong catalytic ability to $H_2O_2$ decomposition is showed. The accumulated concentration of •OH reaches to 76 μM after 240 min, and the corresponding of metalaxyl TOC removal is 58% (Figure S4). Although the FCA shows good Fenton catalytic activity to degrade metalaxyl, the TOC removal is obviously lower than E-Fenton process (98%). The reason is the •OH is only produce from FCA cathode in heterogeneous Fenton, while both FCA cathode and BDD anode are contributed together to the ·OH generation in Electro-Fenton system.

Furthermore, steady-state $H_2O_2$ concentration with 5 wt% FCA is also determined. From Figure S5, concentration of $H_2O_2$ electro-generated on the pure CA cathode increases to 35 mg $L^{-1}$ after 240 min, indicating the CA is a proper electrode for Electro-Fenton reaction, while the corresponding value on the 5 wt% FCA is only about 6 mg $L^{-1}$. It is attributed that the electrogenerated $H_2O_2$ could be in situ catalytically decomposed to •OH promptly, and the accumulation of $H_2O_2$ is difficult on the FCA cathode.

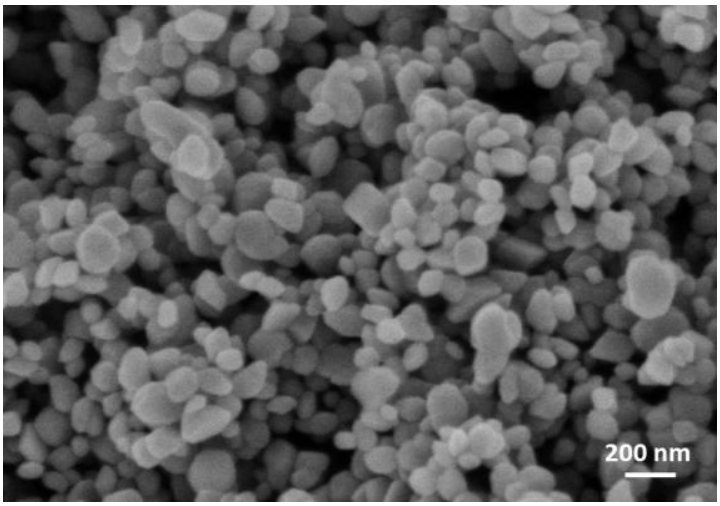


Figure S1. SEM images of fresh $Fe@Fe_2O_3$/CA electrodes

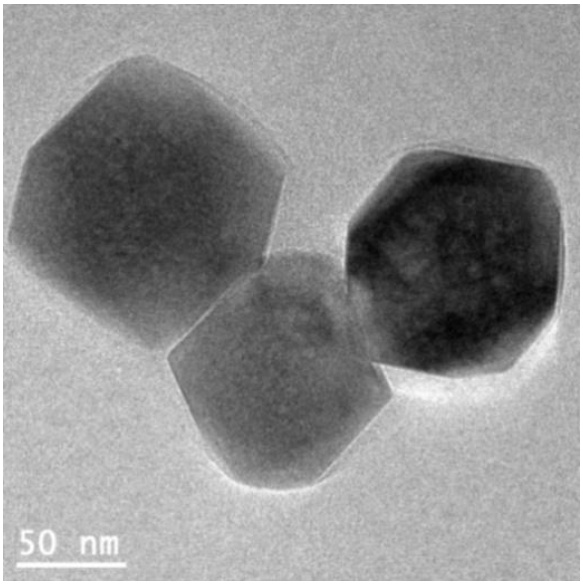


Figure S2. TEM images of fresh $Fe@Fe_2O_3$ nanopaticle on the $Fe@Fe_2O_3$/CA

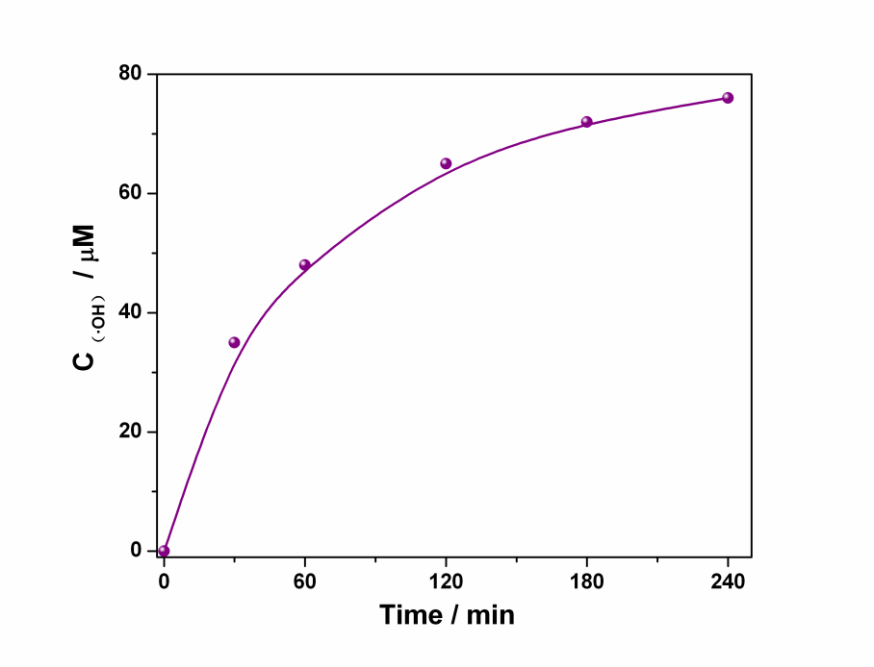


Figure S3. Changes of accumulated ·OH concentration with reaction time (placing 5 wt% FCA in 5 mM $H_2O_2$ solution, pH = 6.0)

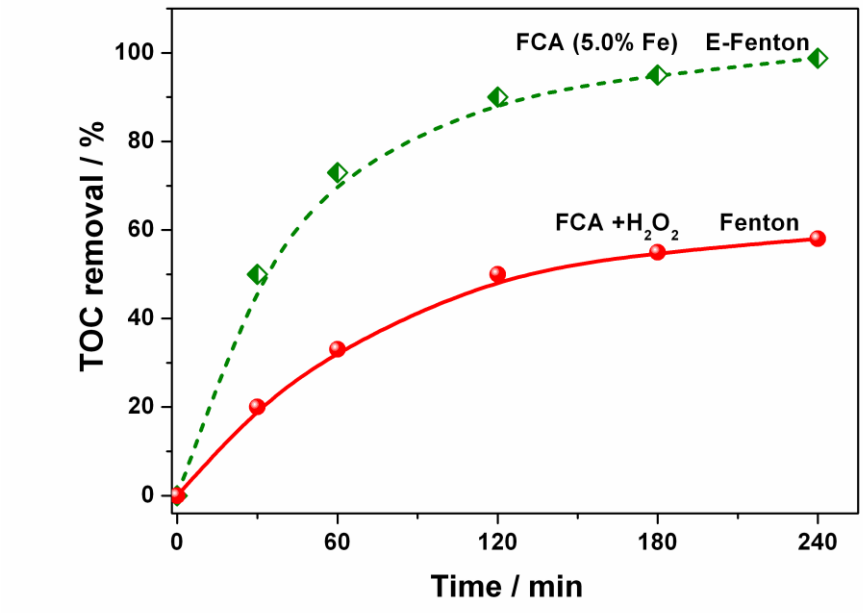


Figure S4. Changes of metalaxyl TOC removal with reaction time using different treatment (pH = 6.0, applied current 10 mA $cm^{-2}$, 0.1 M $Na_2SO_4$ in Electro-Fenton system; pH = 6.0, 5 mM $H_2O_2$ in Fenton system)

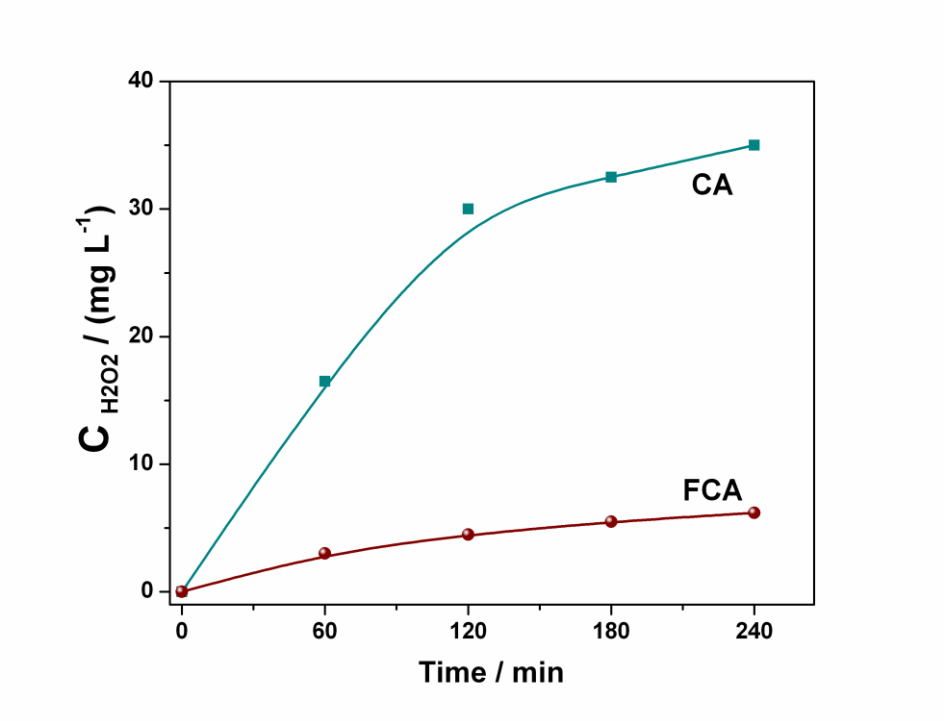


Figure S5. Steady-state concentration of $H_2O_2$ electrogenerated on 5 wt% FCA (pH = 6.0, applied current 10 mA $cm^{-2}$, 0.1 M $Na_2SO_4$)

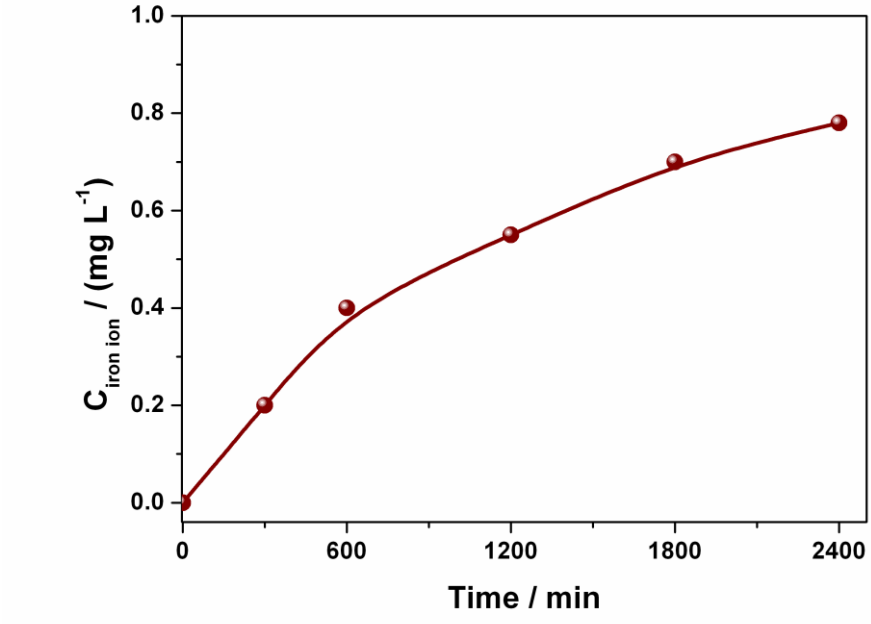


Figure S6. Concentration of leached $Fe^{3+}$ with time (immersing 5 wt% FCA in the diluted HCl solution, pH = 3.0)

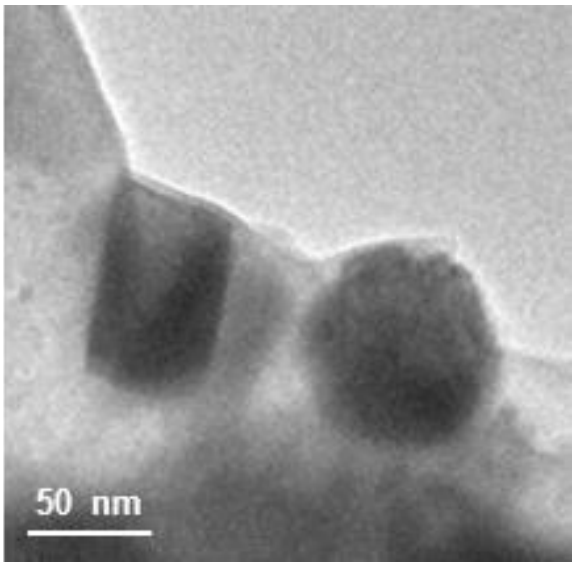


Figure S7. TEM image of 5 wt% FCA with immersing in the diluted HCl solution

(pH = 3.0, 2400 min)