# Supporting Information

## Chemically Regenerative Redox Fuel Cells Using Iron Redox Couple as a Liquid Catalyst with Cocatalysts

*Sang-Beom Han,[1] Da-Hee Kwak,[1] Hyun Suk Park,[1] In-Ae Choi,[1] Jin-Young Park,[1] Kyeng-Bae Ma,[1] Ji-Eun Won,[1] Do-Hyoung Kim,[1] Si-Jin Kim,[1] Min-Cheol Kim,[1] and Kyung-Won Park[1]**

[1] Department of Chemical Engineering, Soongsil University, Seoul 06978, Republic of Korea

* Corresponding author. Tel: 82-2-820-0613. Fax: 82-2-812-5378.

E-mail address: kwpark@ssu.ac.kr (Prof. K.-W. Park).

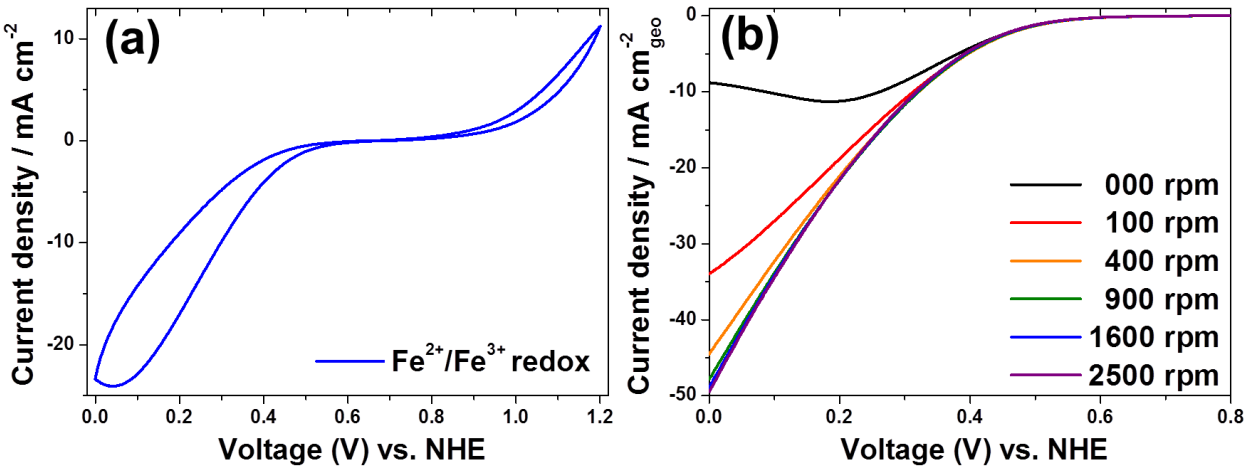


***Figure* S1.** (a) CV of iron redox couple as a liquid catalyst in the solution of $Fe_2(SO_4)_3$ + $H_2SO_4$ on the carbon electrode. (b) LSVs of $Fe^{3+}$-reduction with varying rotating speeds on the glassy carbon electrode in the solution of $Fe_2(SO_4)_3$ + $H_2SO_4$.

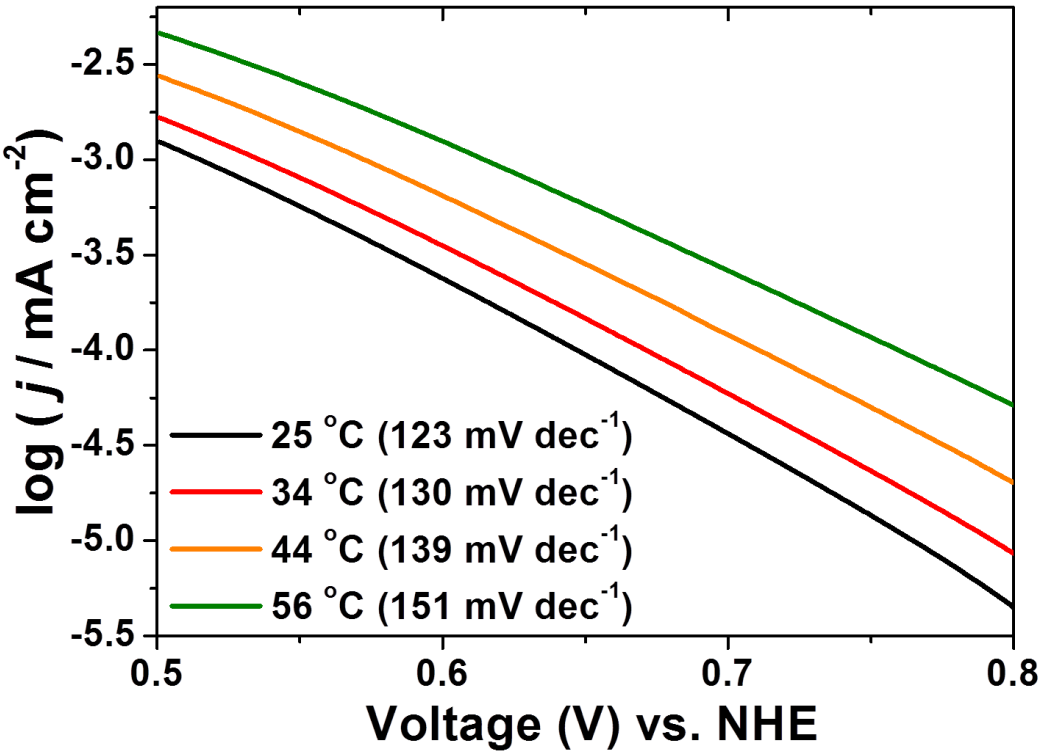


***Figure* S2.** Tafel plots of $Fe^{3+}$-reduction measured on the glassy carbon electrode in the solution of $Fe_2(SO_4)_3$ + $H_2SO_4$ at varying reaction temperatures.

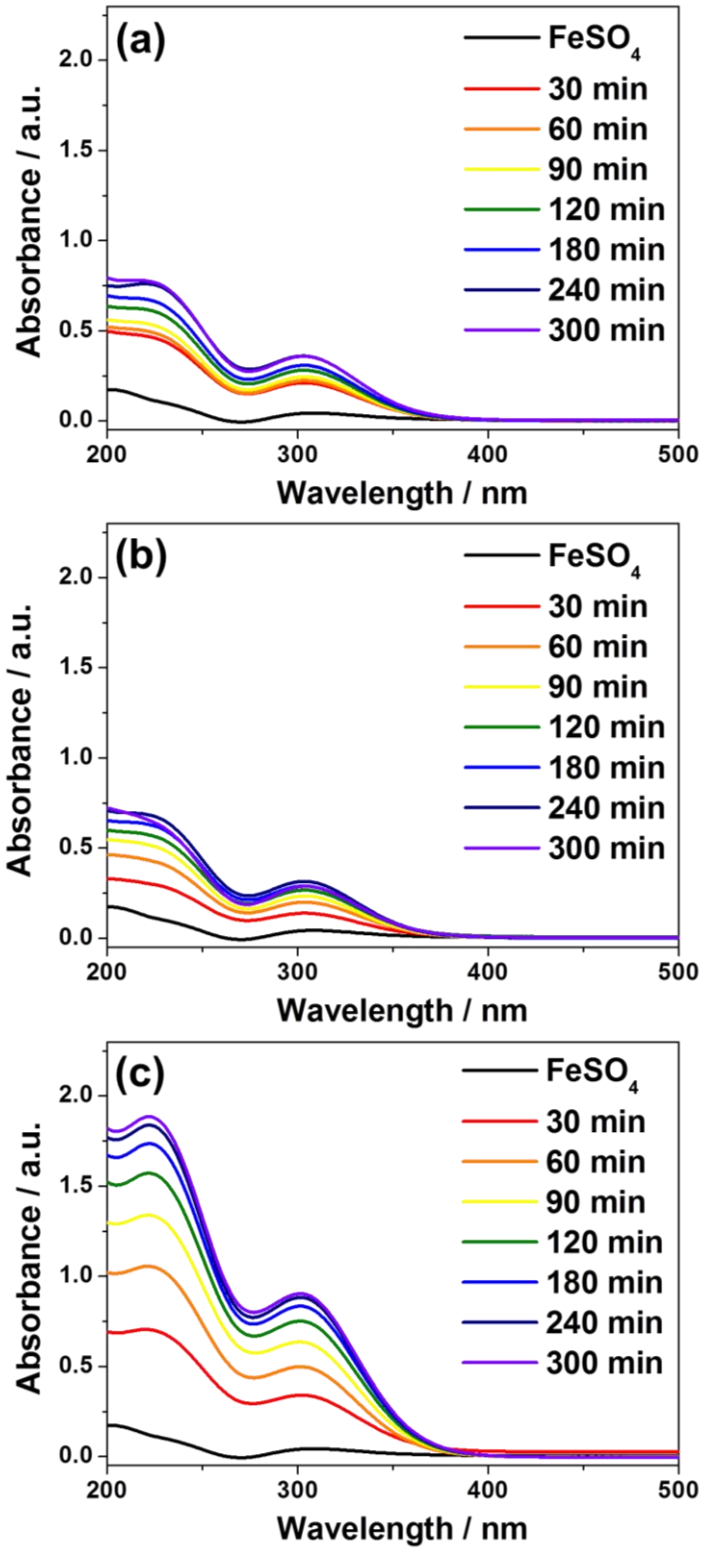


***Figure* S3.** UV-vis absorbance spectra of the solutions of 0.5 M $FeSO_4$ + 1 M $H_2SO_4$ after $O_2$ bubbling as a function of reaction time (a) in the absence of cocatalysts and in the presence of (b) Fe-TMPP and (c) Fe-Pc.

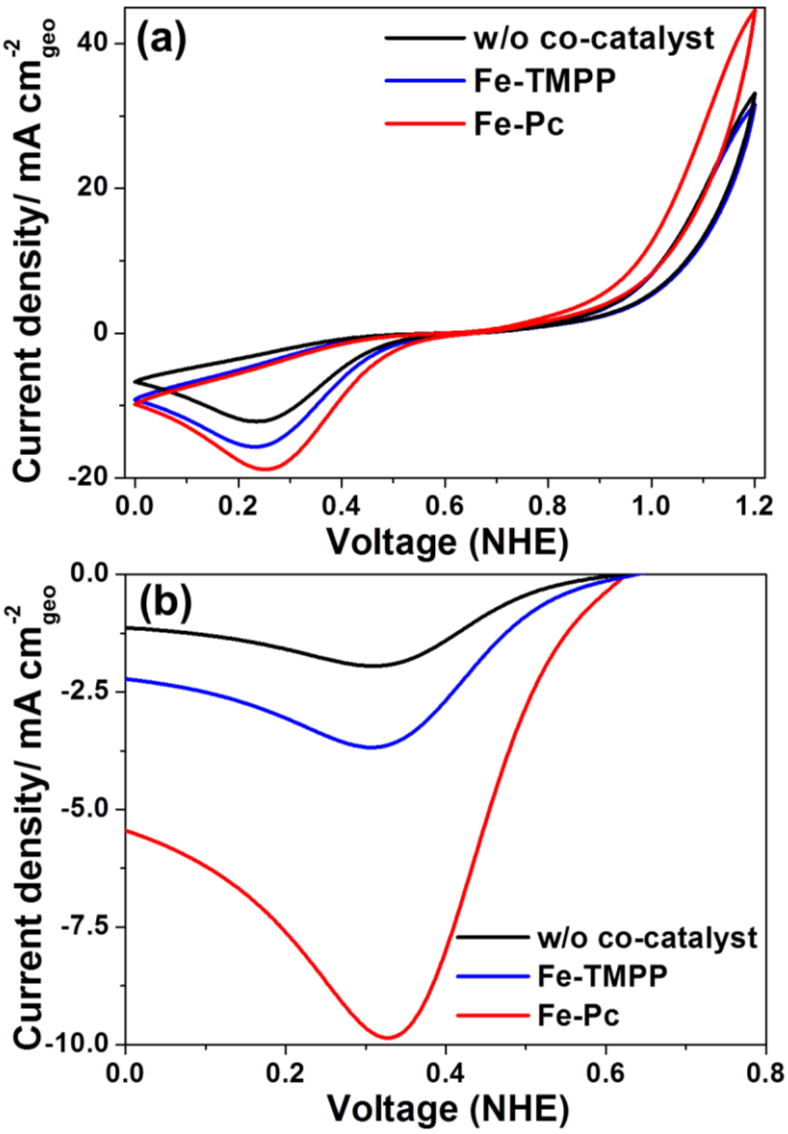


***Figure* S4.** (a) CVs and (b) LSVs of the $Fe^{3+}$-containing solutions oxidized with $Fe^{2+}$ via $O_2$ for 5 h in the absence and the presence of cocatalysts without rotating the electrode.

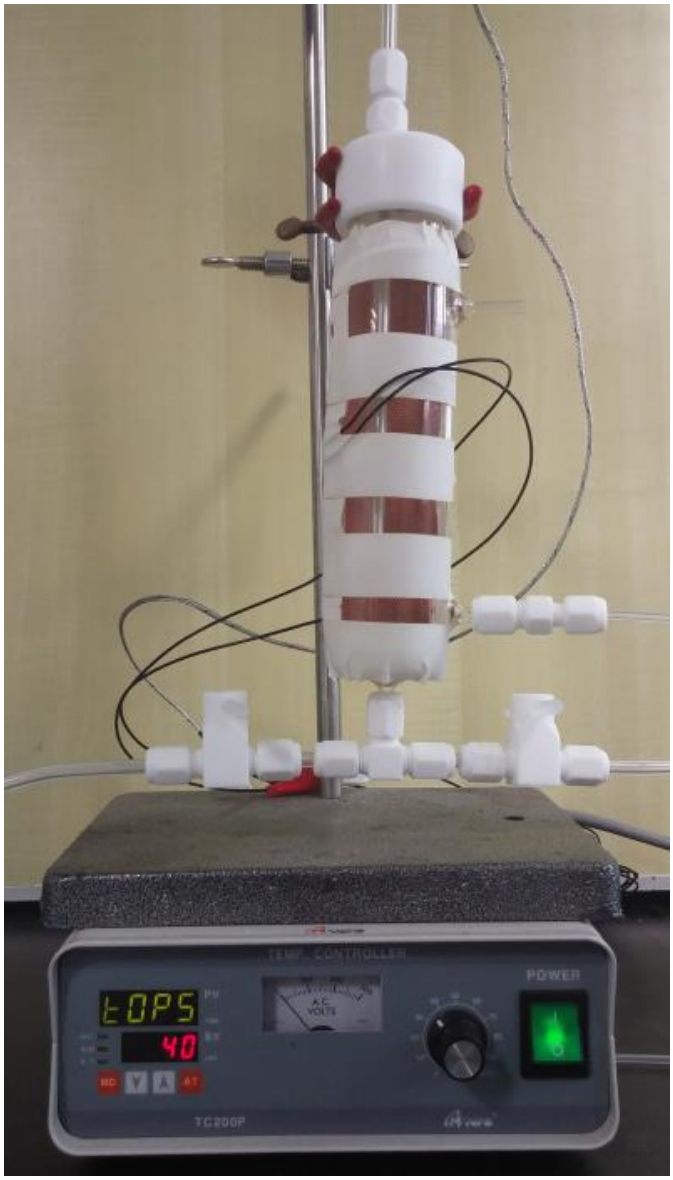


***Figure* S5.** Regeneration reactor for electrochemical reactions in half and unit cells: The solution of 0.5 M $FeSO_4$ + 1 M $H_2SO_4$ (200 mL) was supplied to the reactor and then maintained at 80 $^oC$ for 5 h under $O_2$ bubbling.

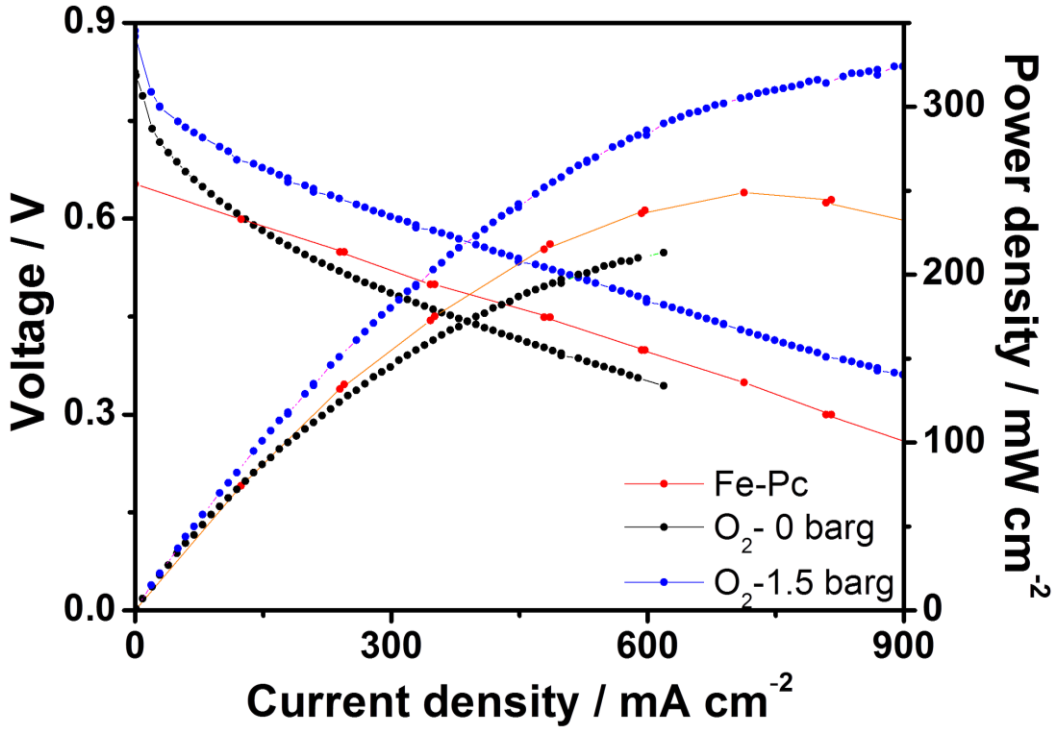


***Figure* S6.** Comparison of polarization curve using the reduction reaction of the liquid catalyst with standard PEM with $Fe/N_4$ electrode as cathode catalysts. The standard unit cell measurement was carried out at 80 $^{o}$C by supplying $H_2$ as a fuel at the anode with a flow rate of 150 mL·min$^{-1}$ and $O_2$ at the cathode with a flow rate of 200 mL·min$^{-1}$.