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Supporting information for article:

Approach to electrochemical modulating differential extended X-ray absorption fine structure

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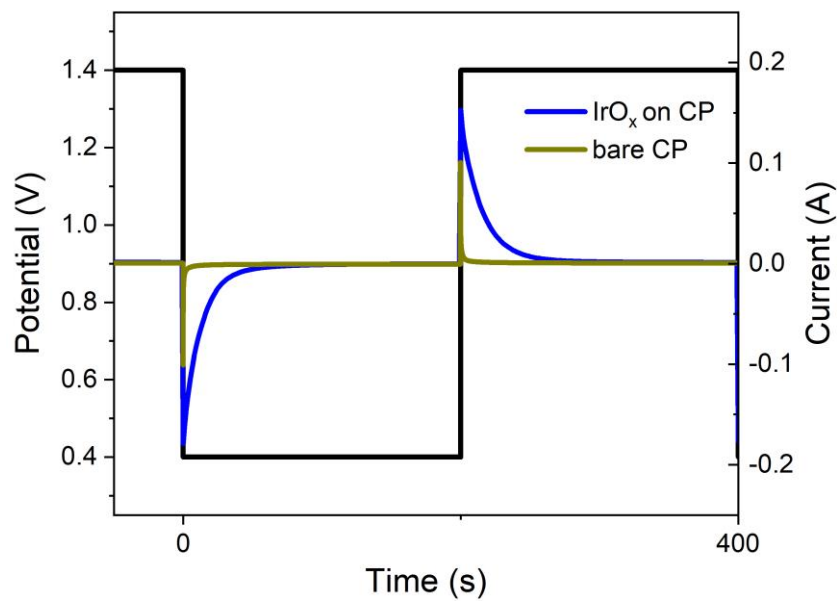


Figure S1 The CA curve of bare carbon.

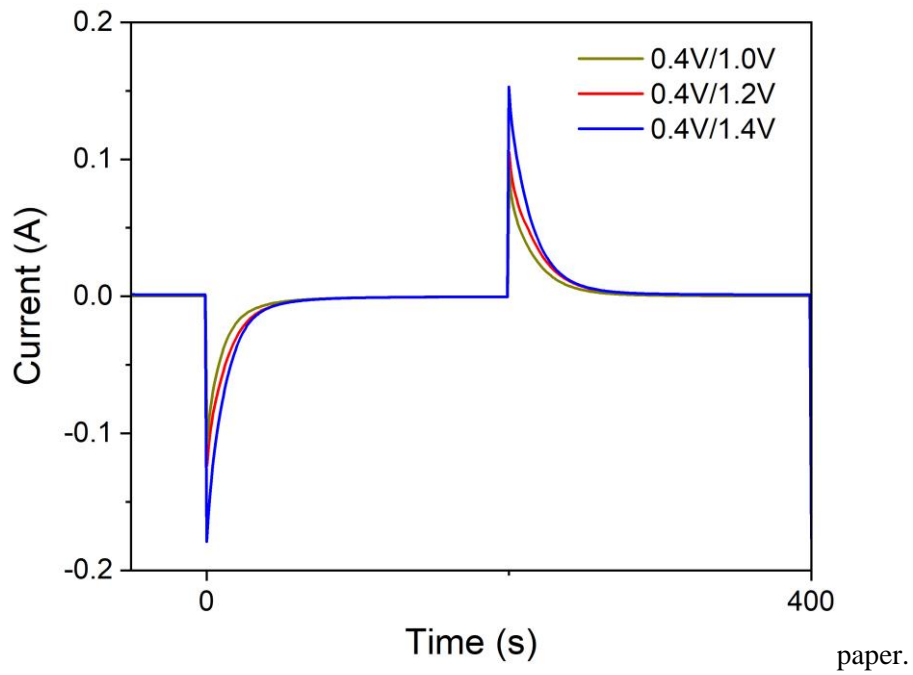


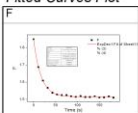
Figure S2 CA curves of different potential condition.

Nonlinear Curve Fit (ExpDec1) (2022/5/2 18:37:17)

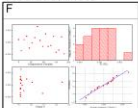
Parameters					
	Value	Standard Error	t-Value	Prob> t	Dependency
y0	1.5147	9.46784E-4	1599.83365	1.16468E-40	0.36108
A1	0.33309	0.00316	105.52492	5.9278E-23	0.25538
F	16.83203	0.33319	50.51827	3.61121E-18	0.391
k	0.05941	0.00118			
tau	11.66707	0.23095			

Reduced Chi-sqr = 1.03090941212E-5
 COD(R^2) = 0.9987740299082
 Iterations Performed = 5
 Total Iterations in Session = 5
 Fit converged. Chi-Sqr tolerance value of 1E-9 was reached.
 Standard Error was scaled with square root of reduced Chi-Sqr.
 k, tau are derived parameter(s).

Fitted Curves Plot



Residual Plots

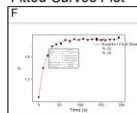


Nonlinear Curve Fit (ExpDec1) (2022/5/2 18:40:32)

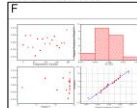
Parameters					
	Value	Standard Error	t-Value	Prob> t	Dependency
y0	1.87778	0.00127	1479.08968	1.60739E-42	0.33116
A1	-0.253	0.00446	-56.74946	7.02115E-20	0.24561
F	16.25421	0.59676	27.23743	7.82314E-15	0.36782
k	0.06152	0.00226			
tau	11.26656	0.41364			

Reduced Chi-sqr = 2.04821932894E-5
 COD(R^2) = 0.9952833691109
 Iterations Performed = 5
 Total Iterations in Session = 5
 Fit converged. Chi-Sqr tolerance value of 1E-9 was reached.
 Standard Error was scaled with square root of reduced Chi-Sqr.
 k, tau are derived parameter(s).

Fitted Curves Plot



Residual Plots

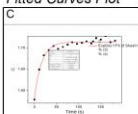


Nonlinear Curve Fit (ExpDec1) (2022/5/2 18:35:30)

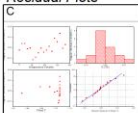
Parameters					
	Value	Standard Error	t-Value	Prob> t	Dependency
y0	1.71436	0.00189	908.73101	5.63326E-37	0.34734
A1	-0.13341	0.00639	-20.89029	1.67714E-12	0.24705
C	16.14487	1.62212	9.95293	5.31673E-8	0.3759
k	0.06194	0.00622			
tau	11.19077	1.12437			

Reduced Chi-sqr = 4.18108367823E-5
 COD(R^2) = 0.98963070259408
 Iterations Performed = 8
 Total Iterations in Session = 8
 Fit converged. Chi-Sqr tolerance value of 1E-9 was reached.
 Standard Error was scaled with square root of reduced Chi-Sqr.
 k, tau are derived parameter(s).

Fitted Curves Plot



Residual Plots

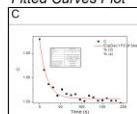


Nonlinear Curve Fit (ExpDec1) (2022/5/2 18:33:14)

Parameters					
	Value	Standard Error	t-Value	Prob> t	Dependency
y0	1.55711	0.00181	858.21652	9.73727E-39	0.34842
A1	0.11932	0.00625	19.09189	1.95657E-12	0.25646
C	17.16376	1.8607	9.22435	8.34488E-8	0.38705
k	0.05826	0.00632			
tau	11.89701	1.28974			

Reduced Chi-sqr = 4.07536308728E-5
 COD(R^2) = 0.981977130344
 Iterations Performed = 8
 Total Iterations in Session = 8
 Fit converged. Chi-Sqr tolerance value of 1E-9 was reached.
 Standard Error was scaled with square root of reduced Chi-Sqr.
 k, tau are derived parameter(s).

Fitted Curves Plot



Residual Plots

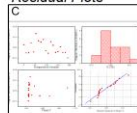


Figure S5 Fitting result of the relaxation curve of absorption coefficient to determine the time constant τ .

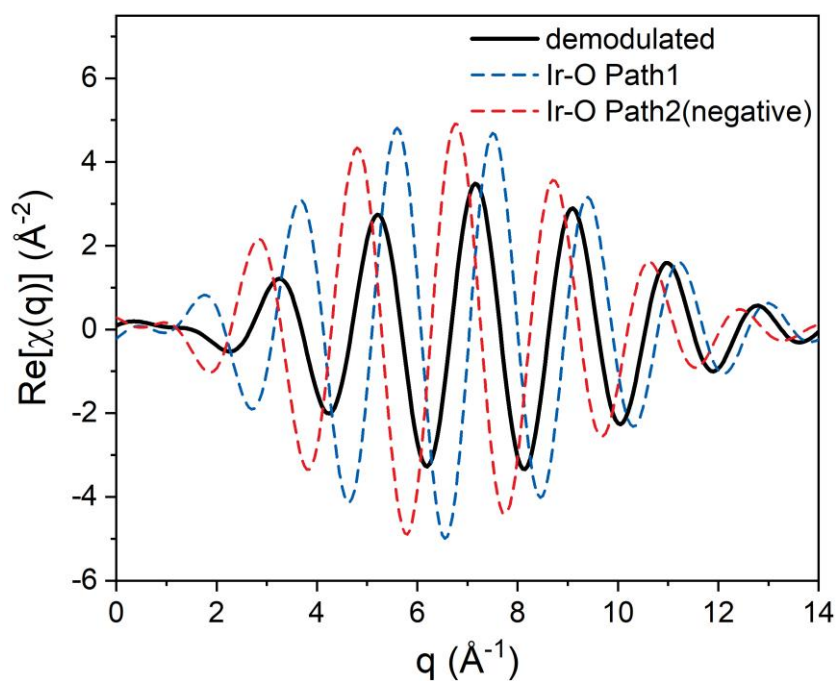


Figure S6 The paths used for fitting the demodulated spectrum.

Table S1 The fitting variables used for EXAFS fitting.

0.4V	Ir-O	N1	ΔE_{01}	$\Delta R1$	σ^2_1
1.4V	Ir-O	N2	ΔE_{02}	$\Delta R2$	σ^2_2
Demodulated	Ir-O	N1	ΔE_{01}	$\Delta R1$	σ^2_1
	Ir-O	-N2	ΔE_{02}	$\Delta R2$	σ^2_2

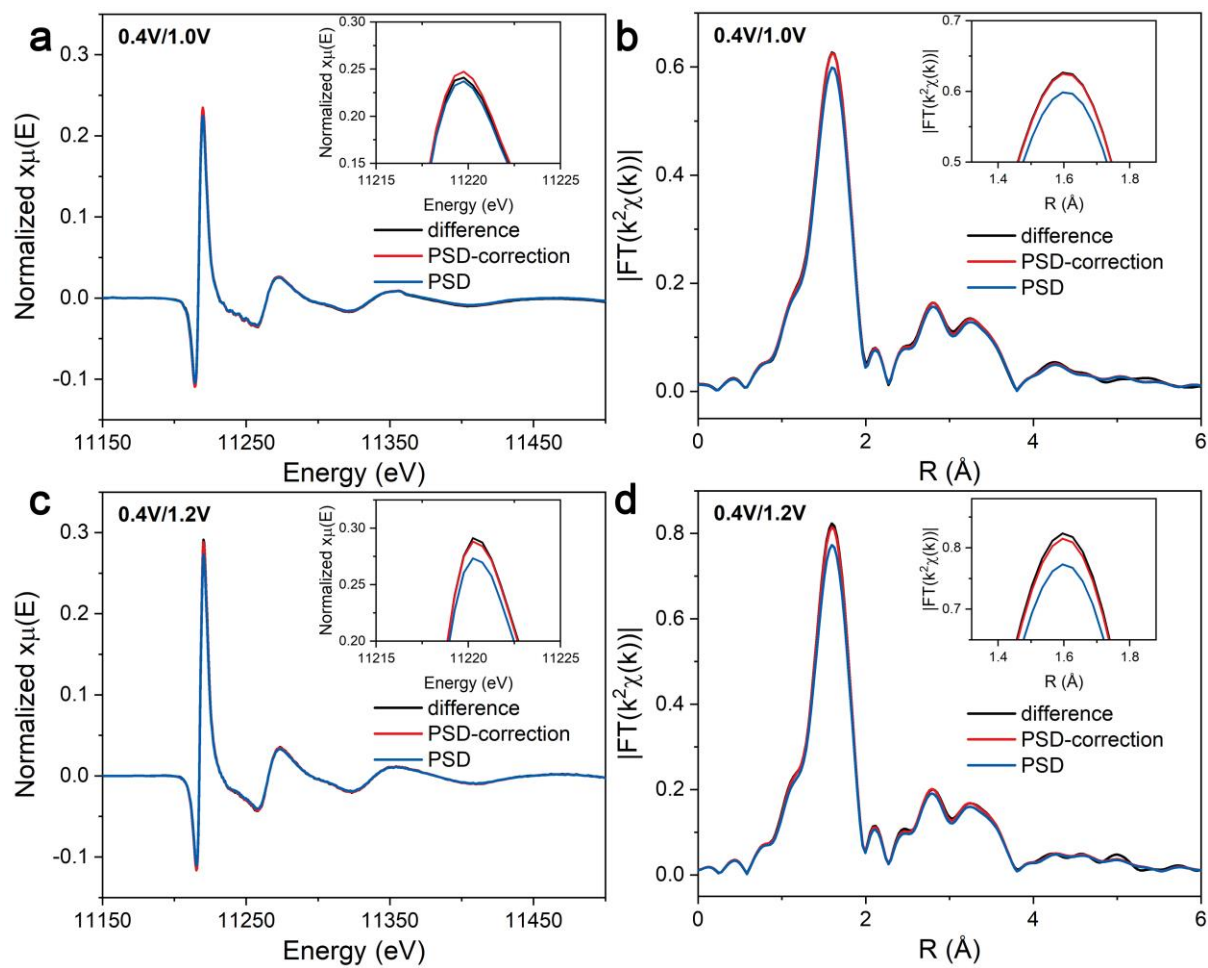


Figure S7 Correction results at other experiment conditions.

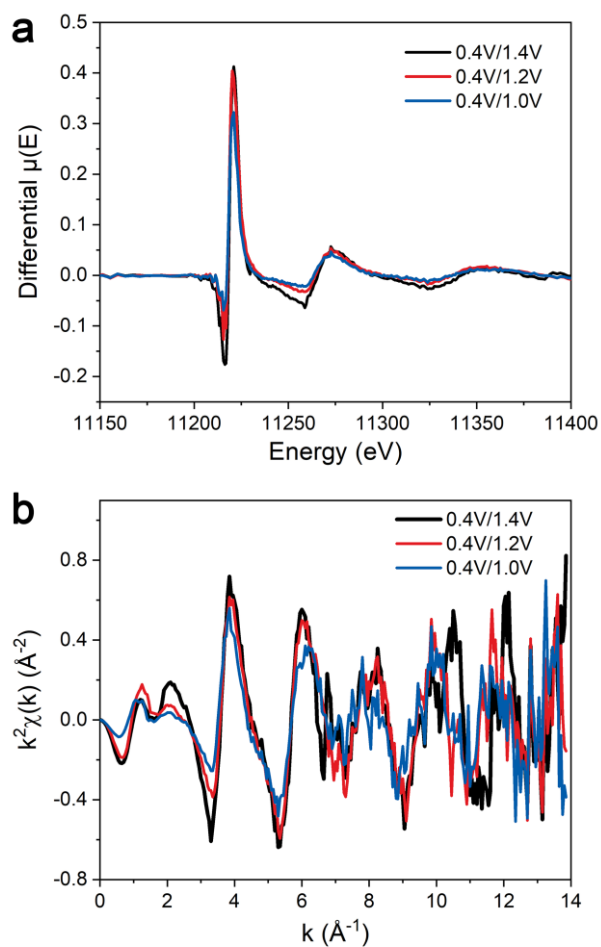


Figure S8 Difference spectra obtained from direct minus of normally tested in-situ XAFS where a static potential is applied.

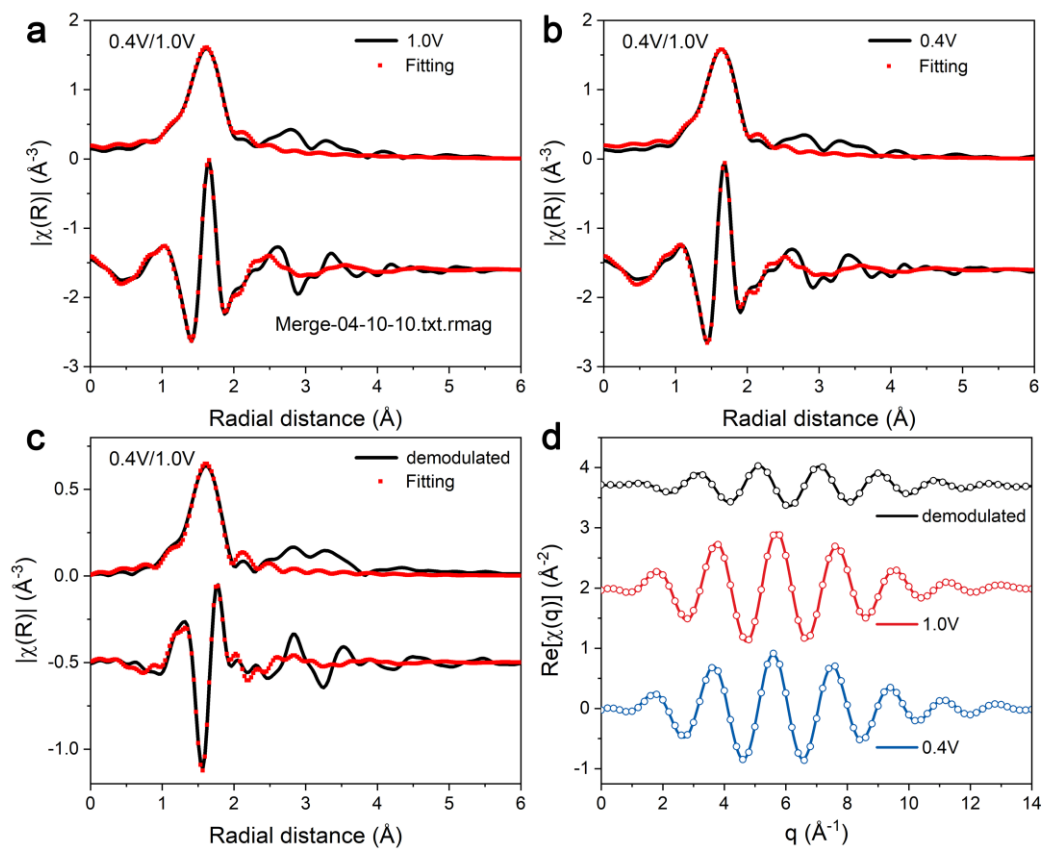


Figure S9 Fitted curves of modulating potential 0.4V/1.0V.

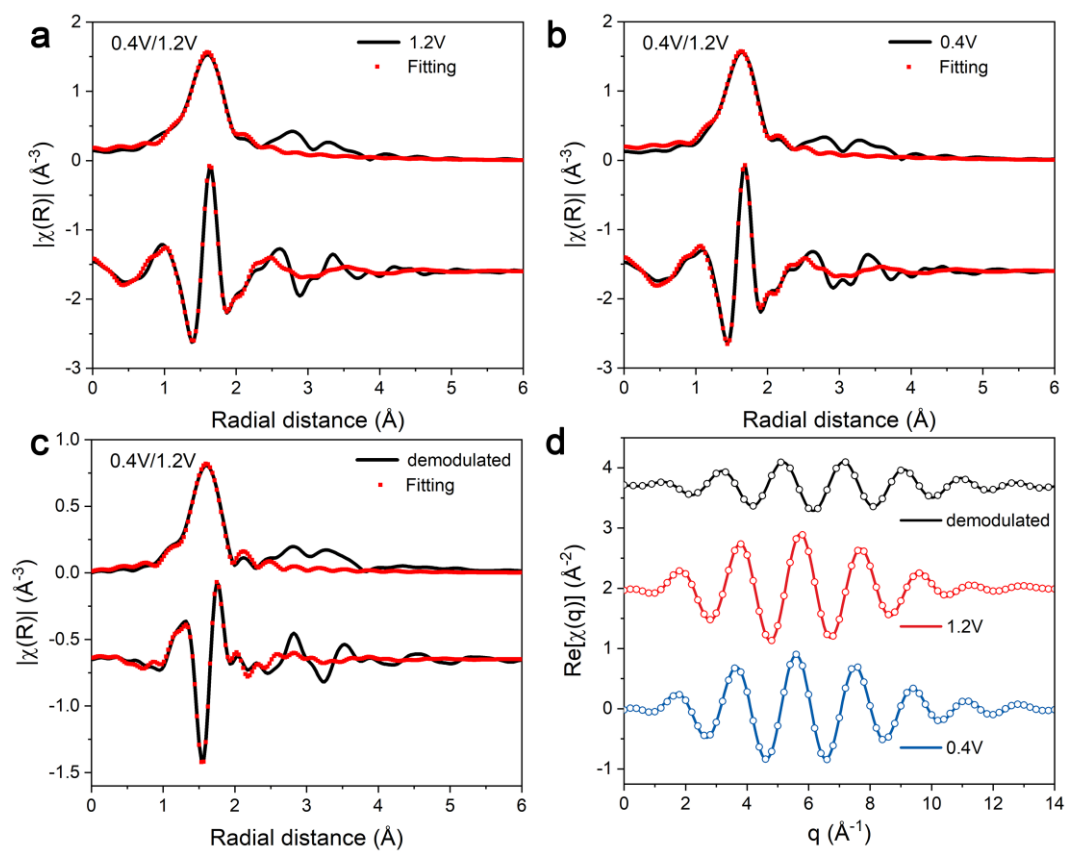


Figure S10 Fitted curves of modulating potential 0.4V/1.2V.

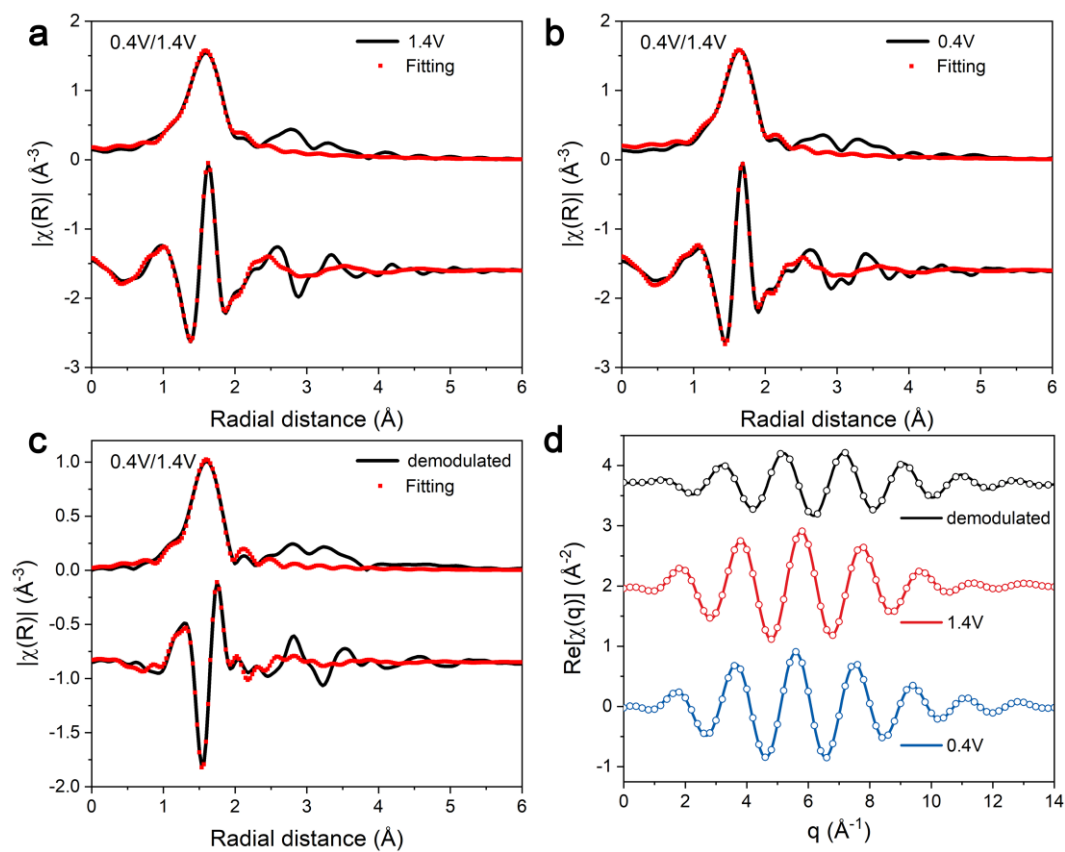


Figure S11 Fitted curves of modulating potential 0.4V/1.4V.

Reference

Nong, H. N., Falling, L. J., Bergmann, A., Klingenhof, M., Tran, H. P., Spori, C., Mom, R., Timoshenko, J., Zichittella, G., Knop-Gericke, A., Piccinin, S., Perez-Ramirez, J., Cuenya, B. R., Schlogl, R., Strasser, P., Teschner, D. & Jones, T. E. (2020). *Nature*, **587**, 408-413.