Electronic Supplementary Material (ESI) for RSC Advances.

Nano-sized layered manganese oxide in a poly-L-glutamic acid matrix: A biomimetic homogenized heterogeneous structural model for water-oxidizing complex in Photosystem II

Mohammad Mahdi Najafpour,*[a,b] Mohadeseh Zarei Ghobadi,[a‡] Davood Jafarian Sedigh[a‡] and Behzad Haghighi,[a,b]

[a]*Department of Chemistry, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, 45137-66731, Iran*

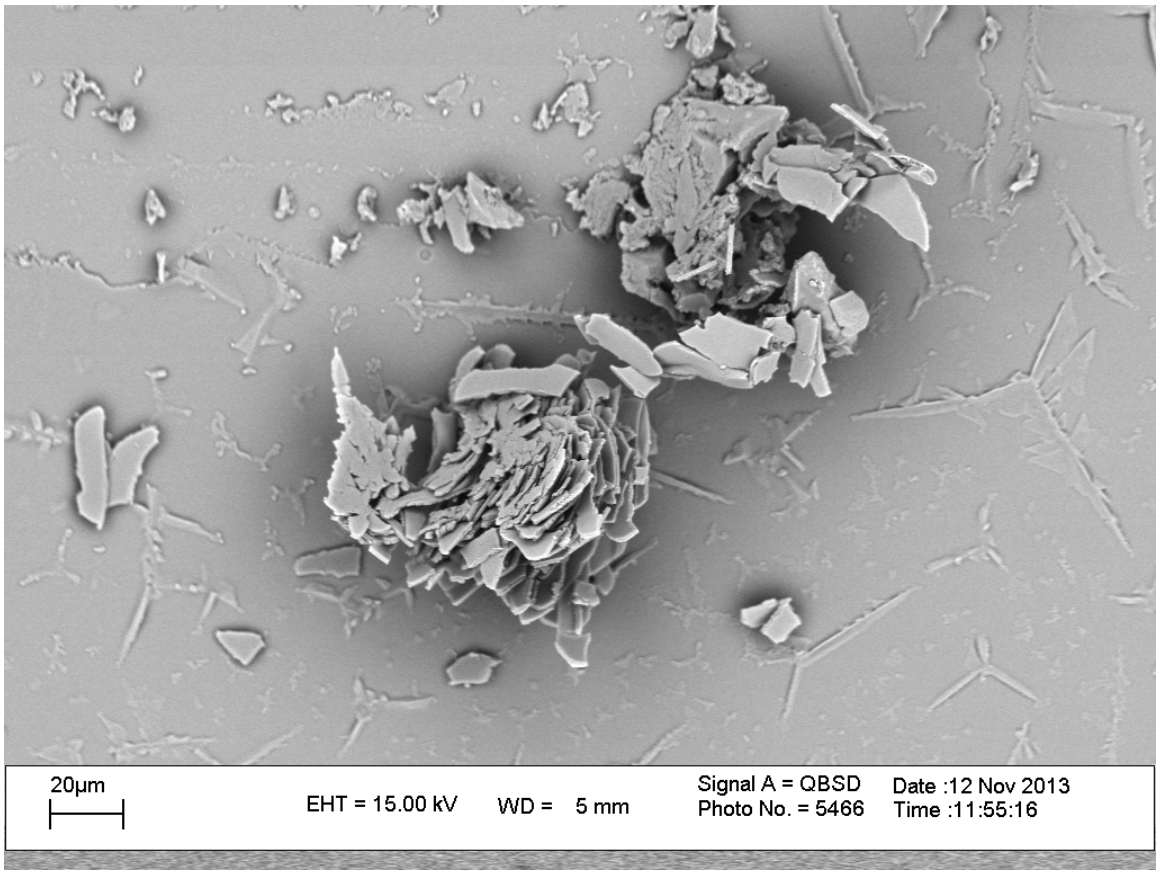
[b]*Center of Climate Change and Global Warming, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, 45137-66731, Iran*

**Corresponding author; Phone: (+98) 241 415 3201; E-mail: mmnajafpour@iasbs.ac.ir*

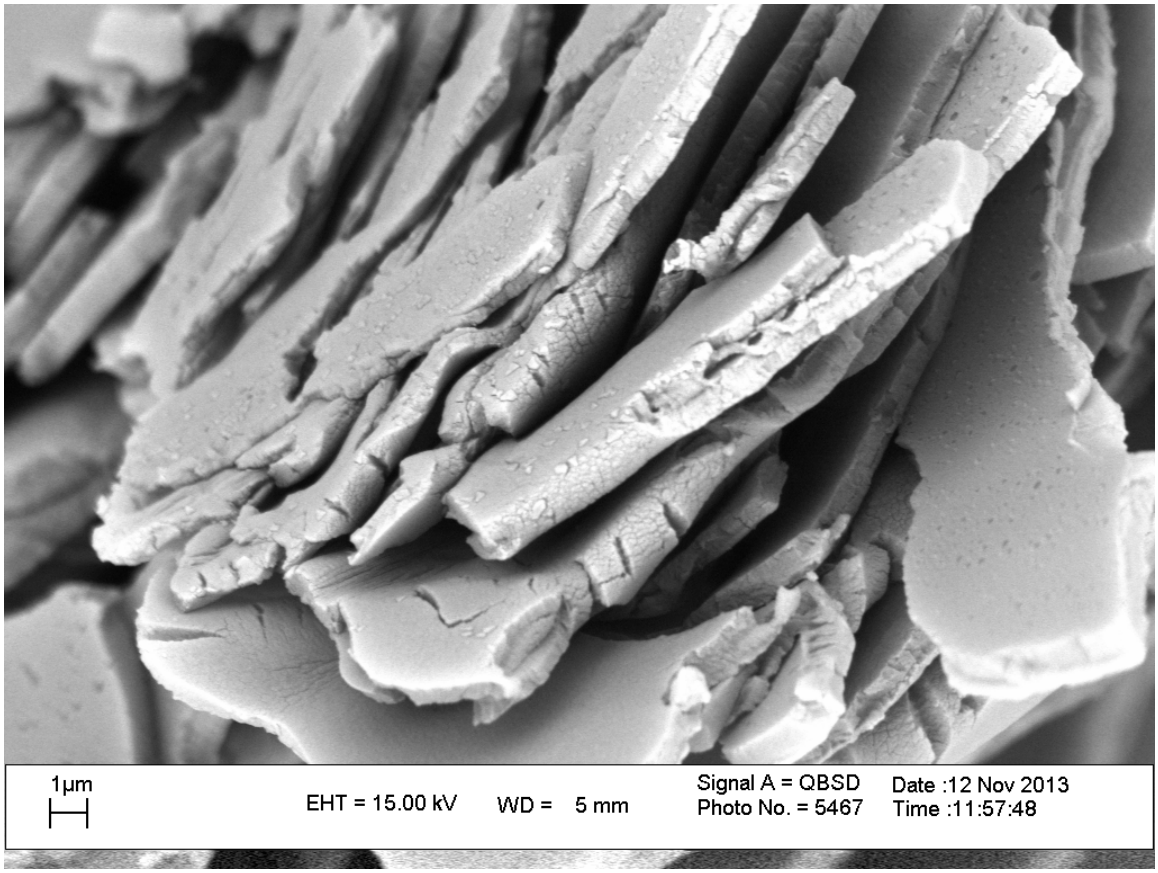
‡ *The authors contributed equally to the work.*

Table of Contents

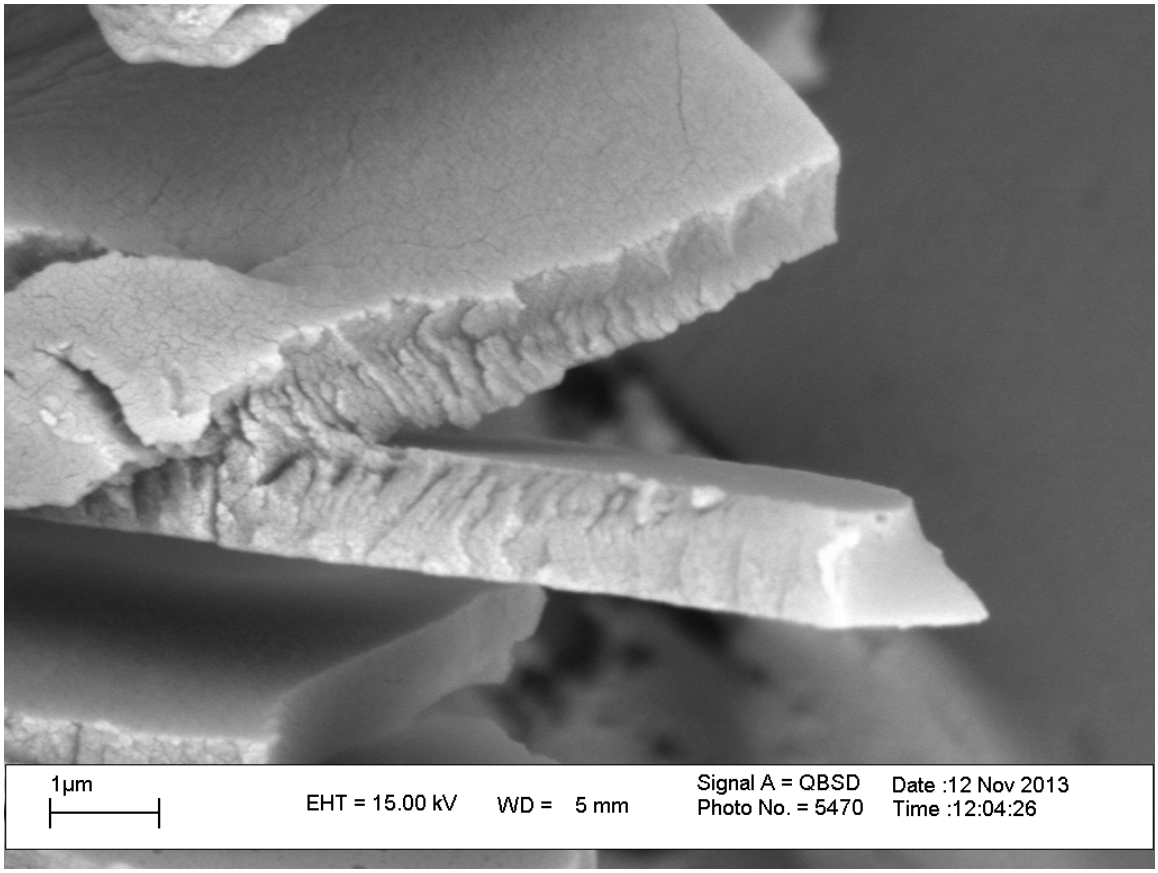
Title	Page
SEM images	3
HRTEM image	7
Cyclic voltammograms and Linear sweep voltammetry	8
FTIR	13


20µm
EHT = 15.00 kV
WD = 5 mm
Signal A = QBSD
Photo No. = 5466
Date :12 Nov 2013
Time :11:55:16

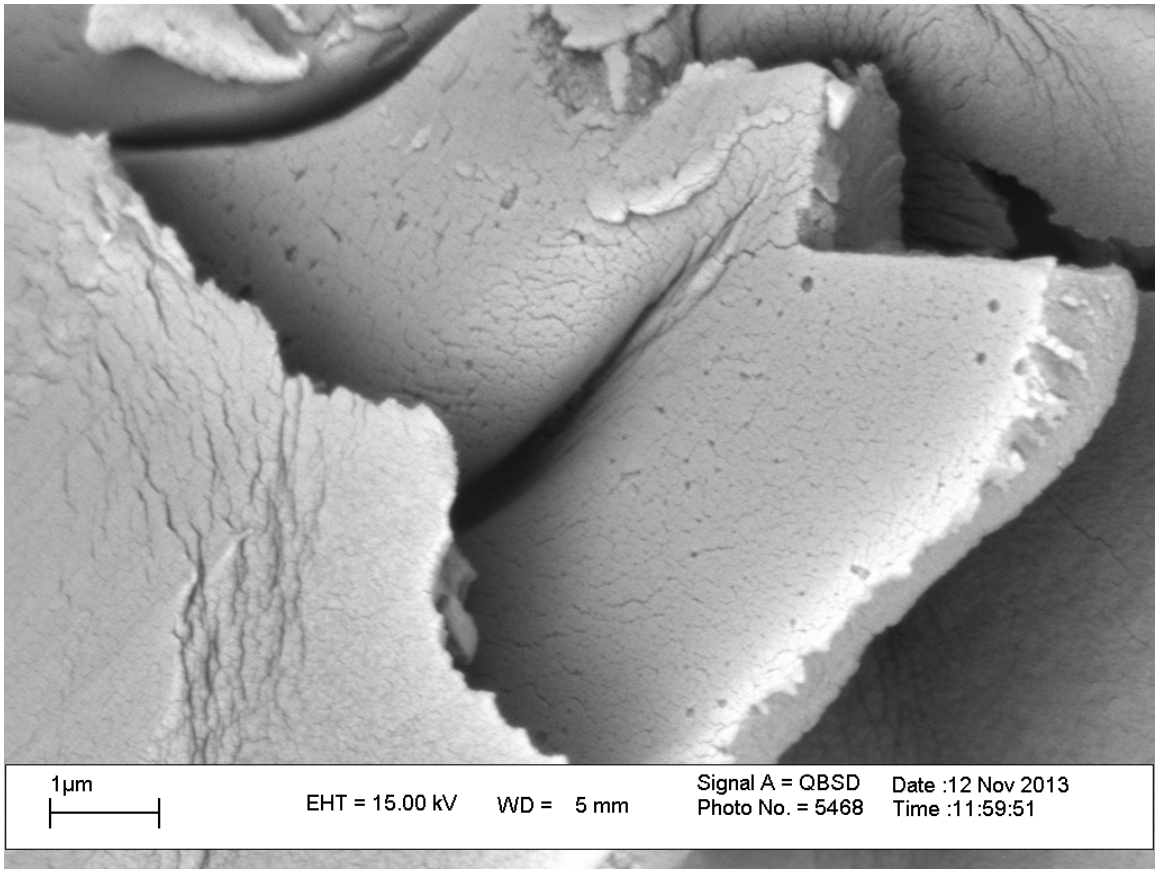
a


1µm
EHT = 15.00 kV
WD = 5 mm
Signal A = QBSD
Photo No. = 5467
Date :12 Nov 2013
Time :11:57:48

b


1µm
EHT = 15.00 kV
WD = 5 mm
Signal A = QBSD
Photo No. = 5470
Date :12 Nov 2013
Time :12:04:26

c



d

Fig. S1. SEM images of dispersed $MnCaO_x$-PGA in water (a-d).

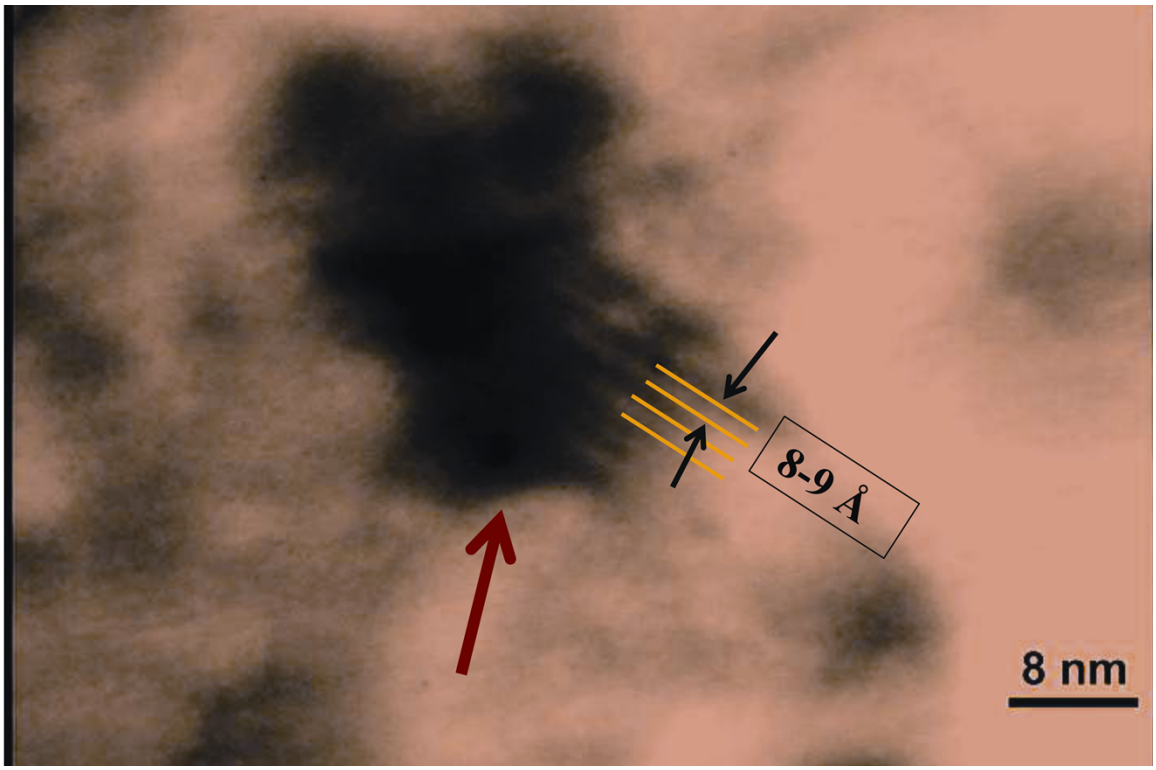


Fig. S2. HRTEM image of dispersed $MnCaO_x$-PGA in water.

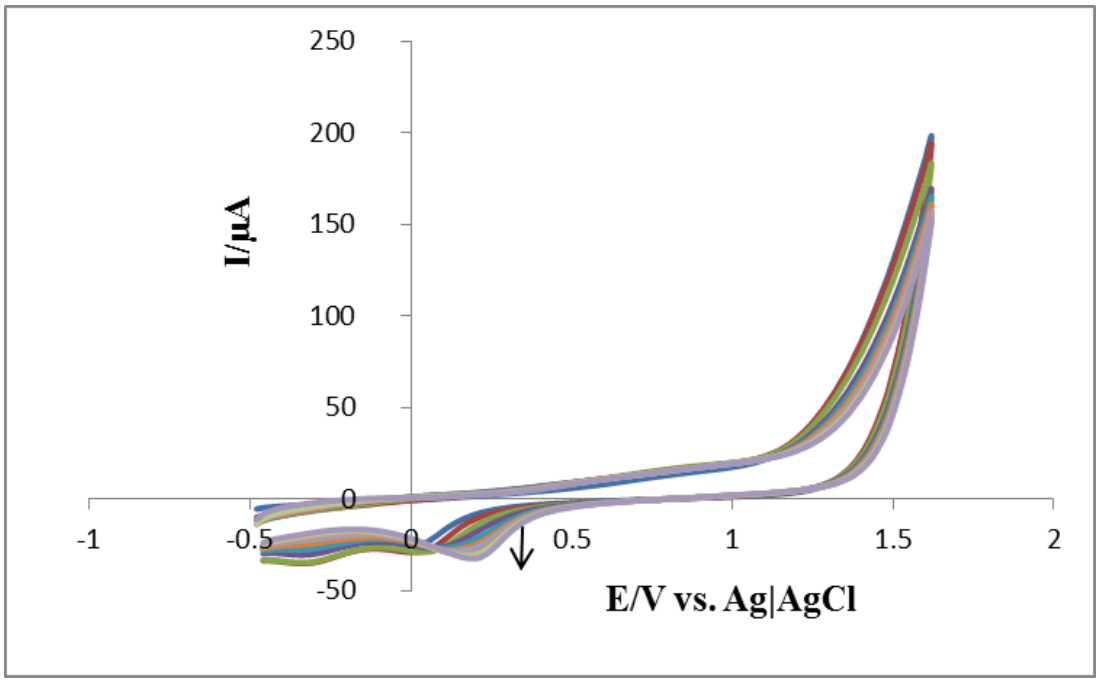


Fig. S3. Cyclic voltammograms of PGA in lithium perchlorate solution (0.1 M in water, pH = 6.3) at a scan rate of 100 mV s^{-1}. The different colors correspond to different cycles on the same electrode.

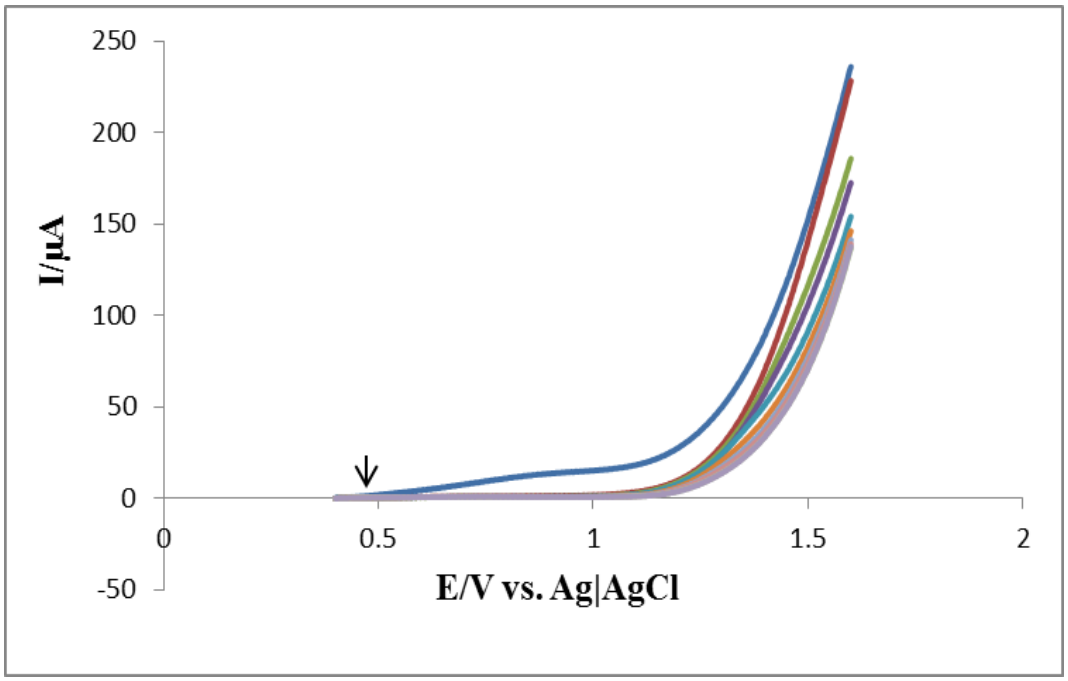


Fig. S4. Linear sweep voltammetry of PGA in lithium perchlorate solution (0.1 M in water, pH = 6.3) at a scan rate of 100 mV s^{-1}. The different colors correspond to different cycles on the same electrode.

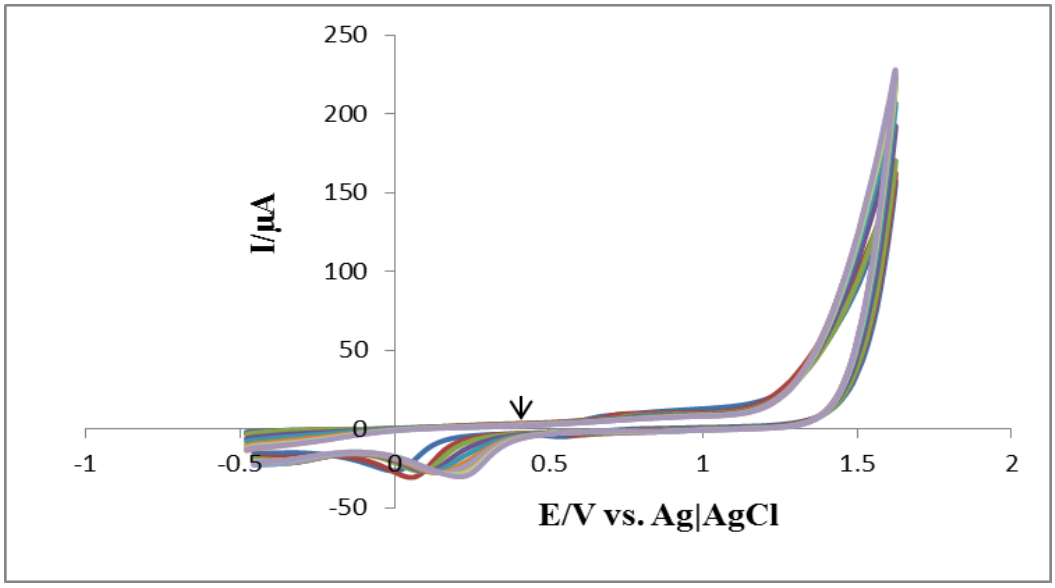


Fig. S5. Cyclic voltammograms of $MnCaO_x$-PGA in lithium perchlorate solution (0.1 M in water, pH = 6.3) at a scan rate of 100 mV s^{-1}. The different colors correspond to different cycles on the same electrode.

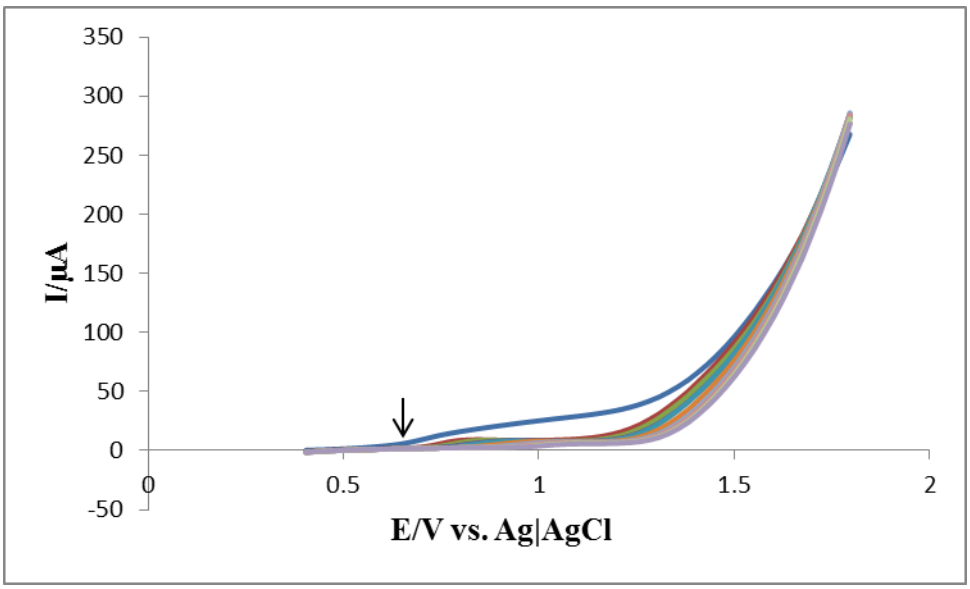


Fig. S6. Linear sweep voltammetry of $MnCaO_x$-PGA in lithium perchlorate solution (0.1 M in water, pH = 6.3) at a scan rate of 100 mV s^{-1}. The different colors correspond to different cycles on the same electrode.

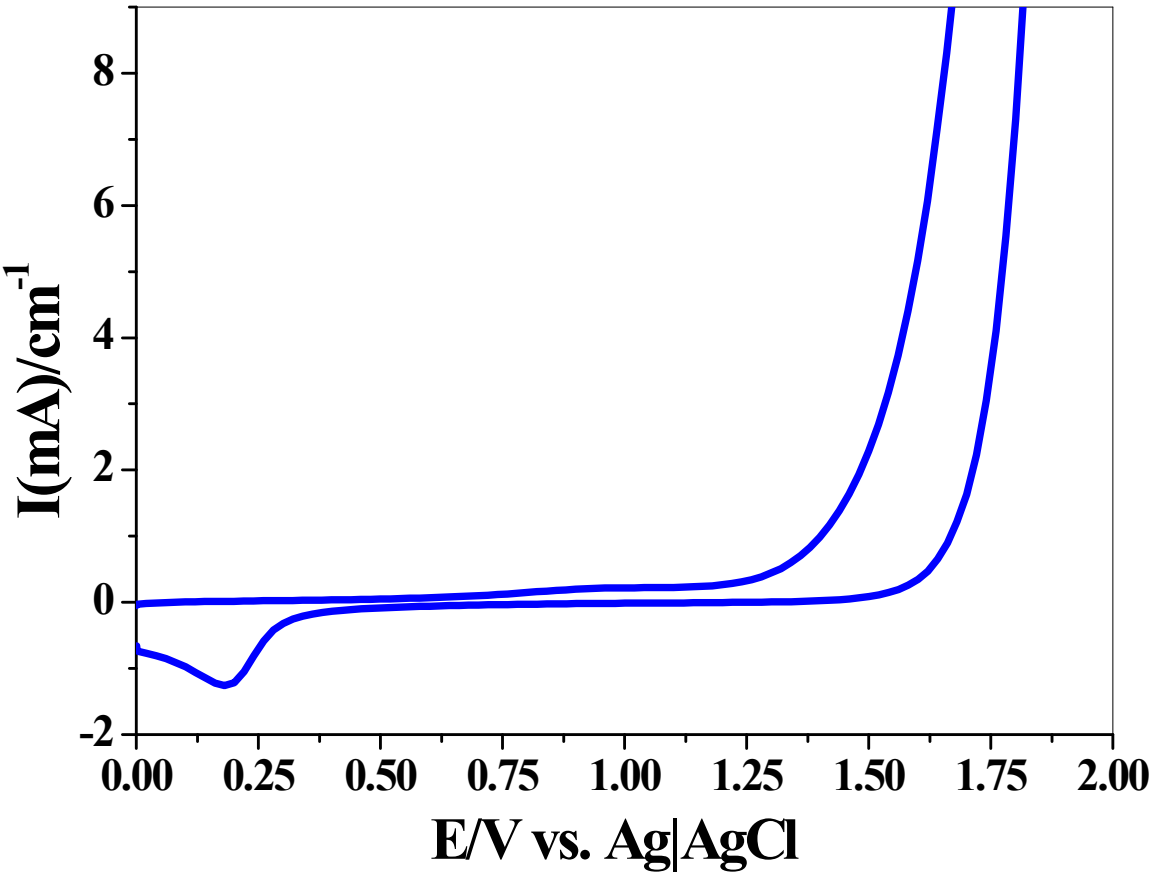


Fig. S7 Cyclic voltammogram of Pt electrode ($LiClO_4$ in water (0.1 M), pH = 6.3) at a scan rate of 100 mV s^{-1}.

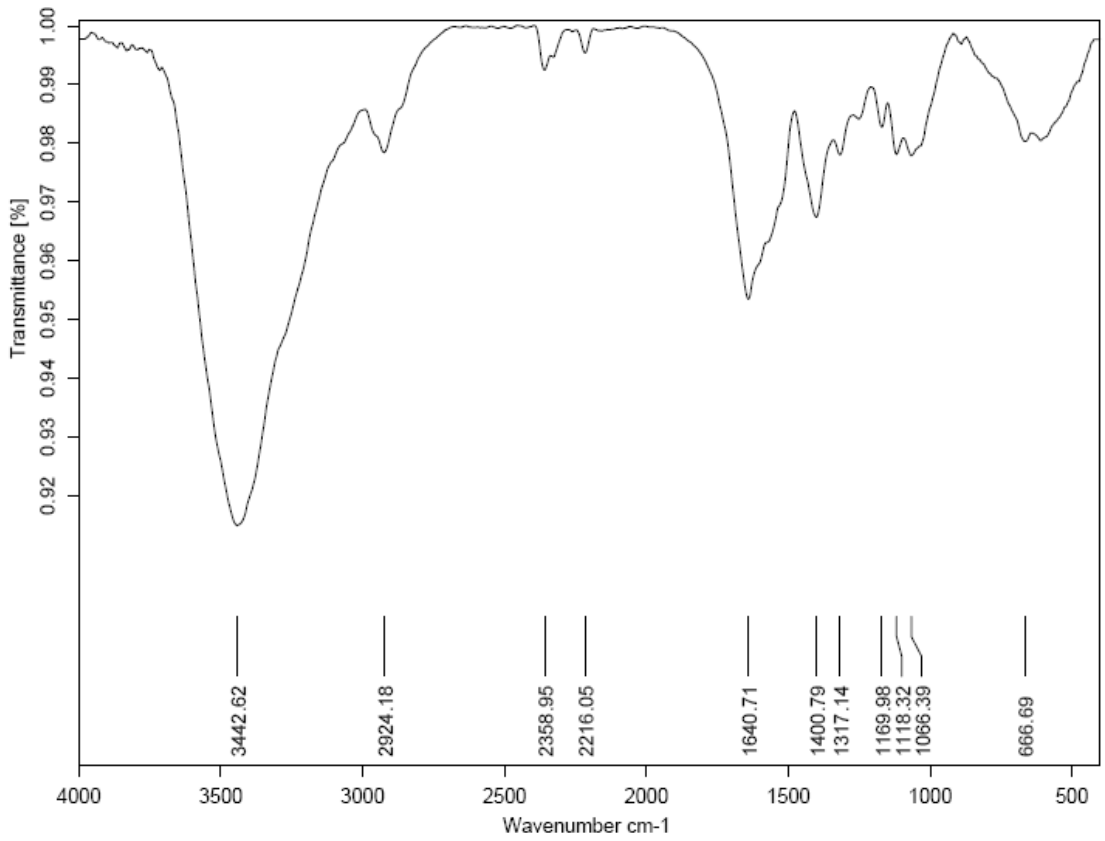


Fig. S8 FTIR spectrum from PGA.

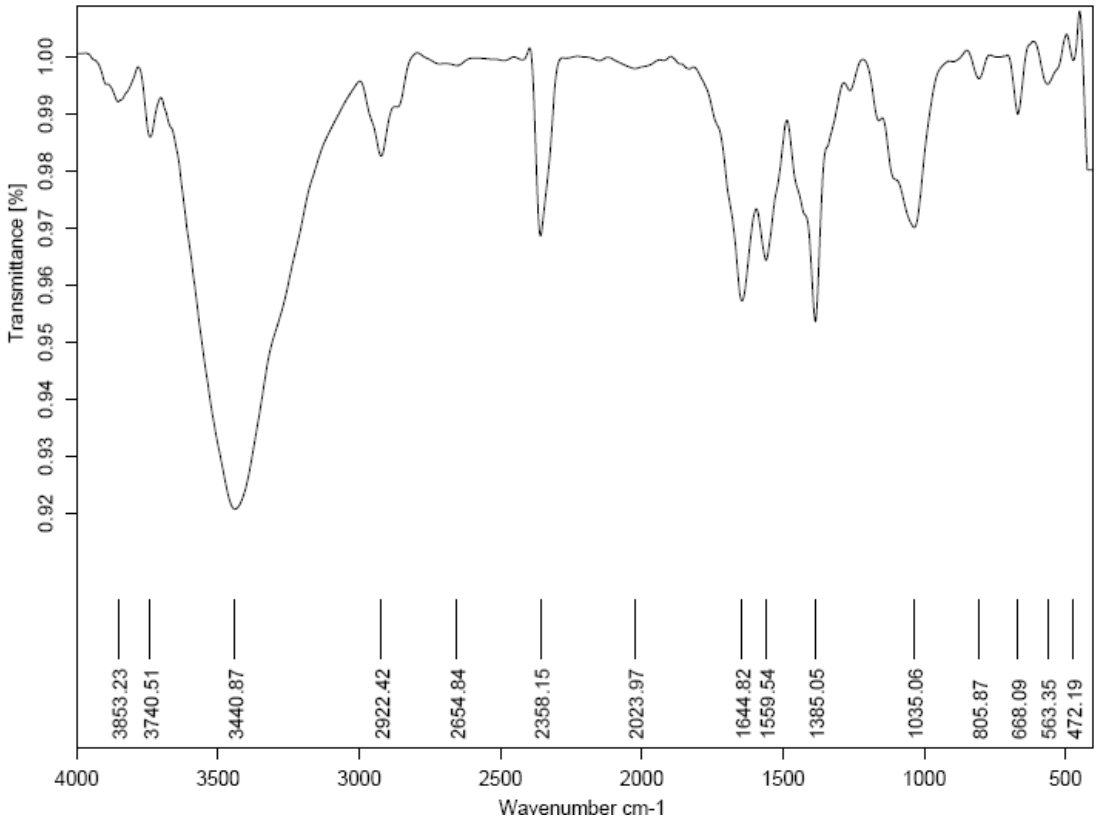


Fig. S9 FTIR spectrum from $MnCaO_x$-PGA.