Electronic Supplementary Material (ESI) for Dalton Transactions.

Electronic Supplementary Information

Nano-sized Mn oxide on halloysite or high surface area montmorillonite as an efficient catalyst for water oxidation with cerium(IV) ammonium nitrate: Supports from natural sources

Mohammad Mahdi Najafpour[a,b*] and Emad Amini[a]

[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) 24 3315 3201; E-mail: mmnajafpour@iasbs.ac.ir*

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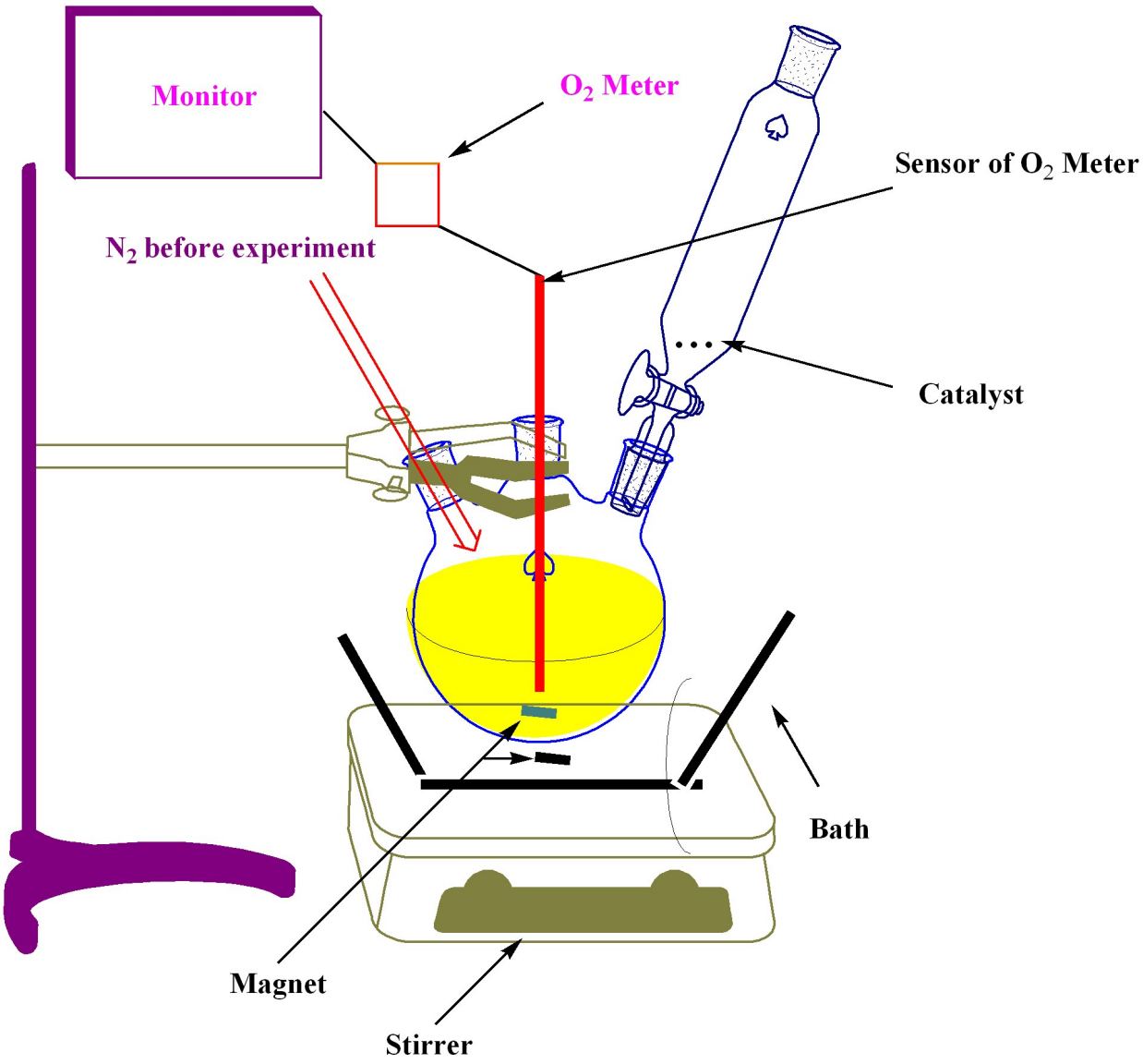


Scheme S1 Set up for water-oxidation experiments.

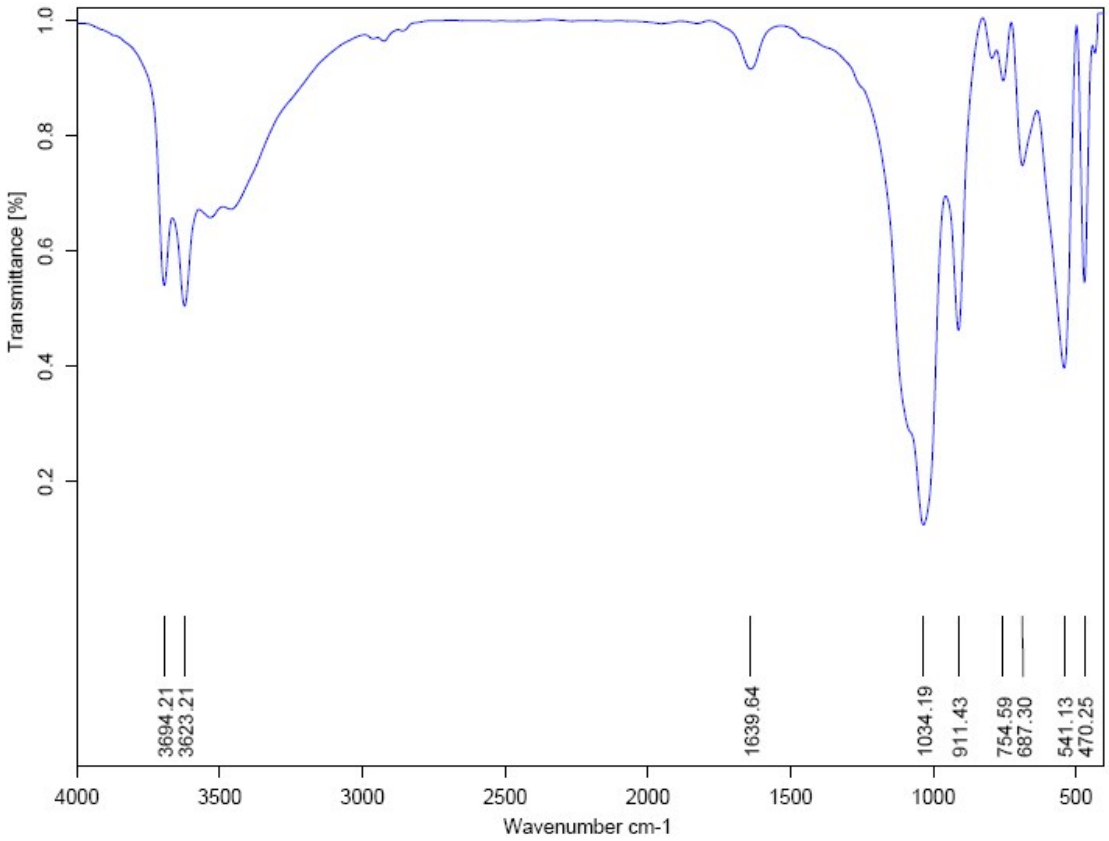


Fig. S1 FTIR spectrum of halloysite

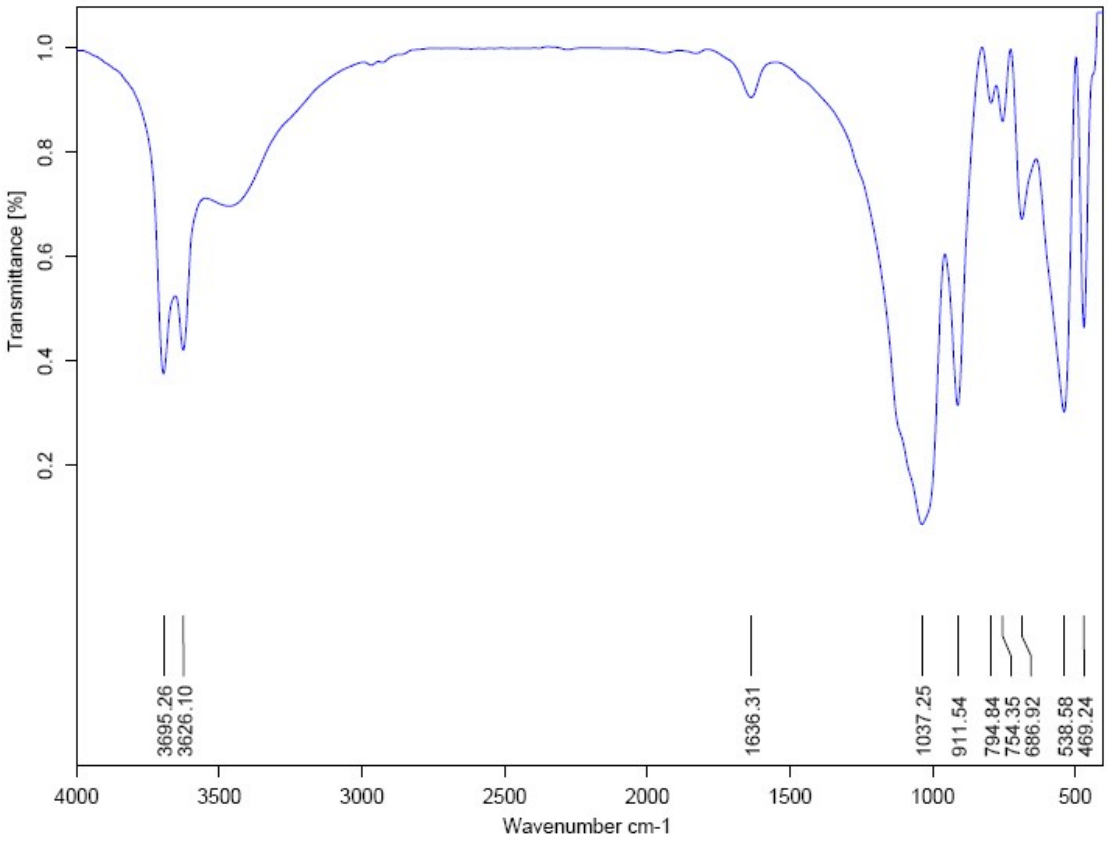


Fig. S2 FTIR spectrum of Mn oxide on halloysite (calcined temperature: 200 ºC).

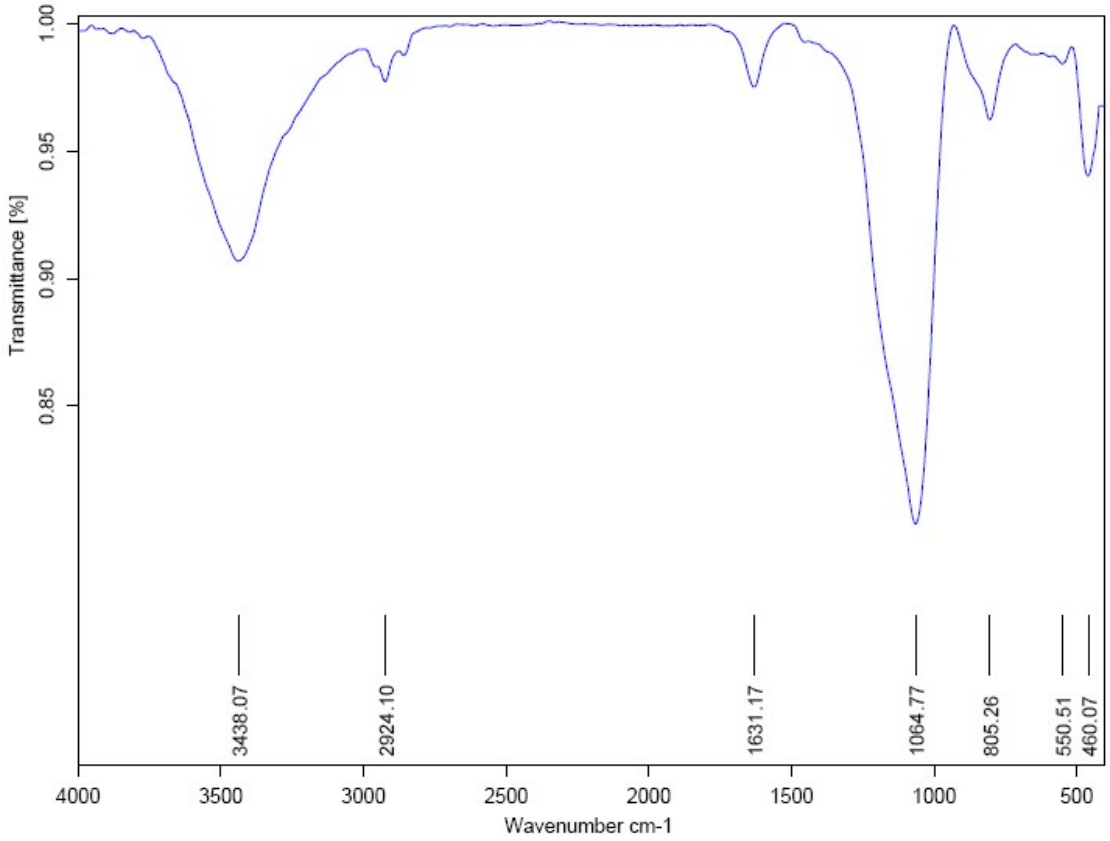


Fig. S3 FTIR spectrum of Mn oxide on halloysite (calcined temperature: 400 ºC).

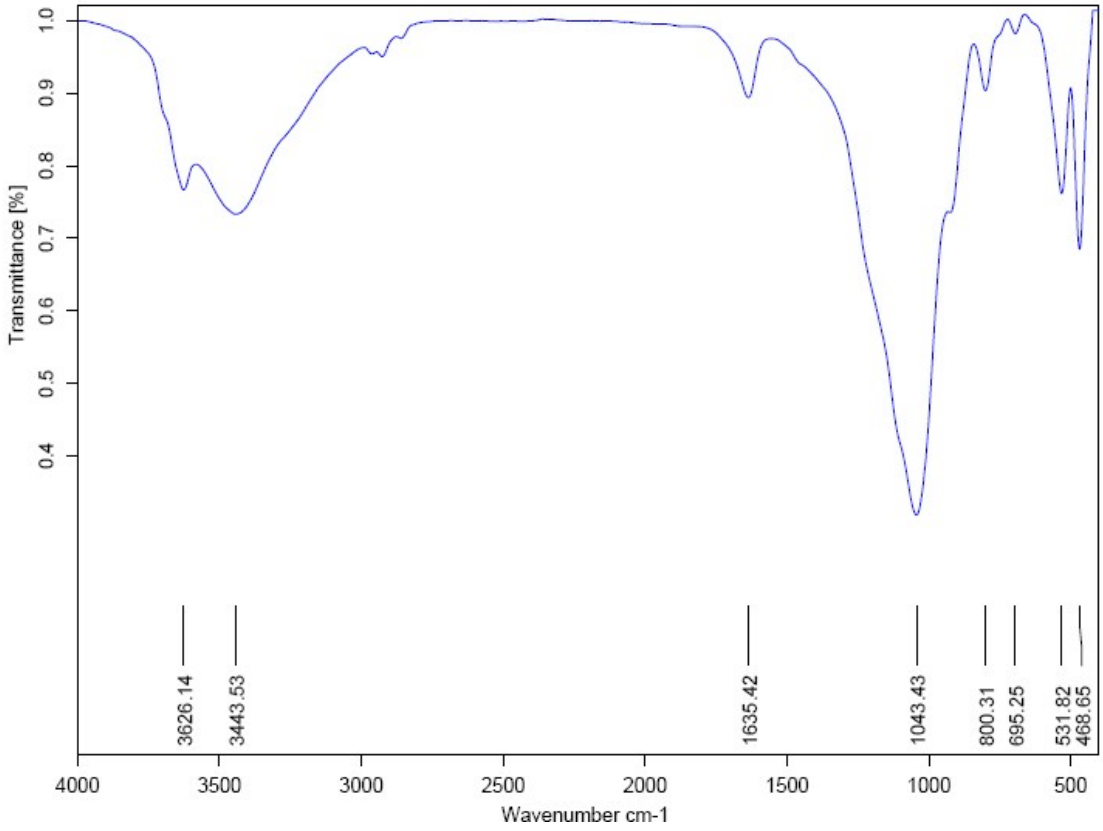


Fig. S4 FTIR spectrum of montmorillonite.

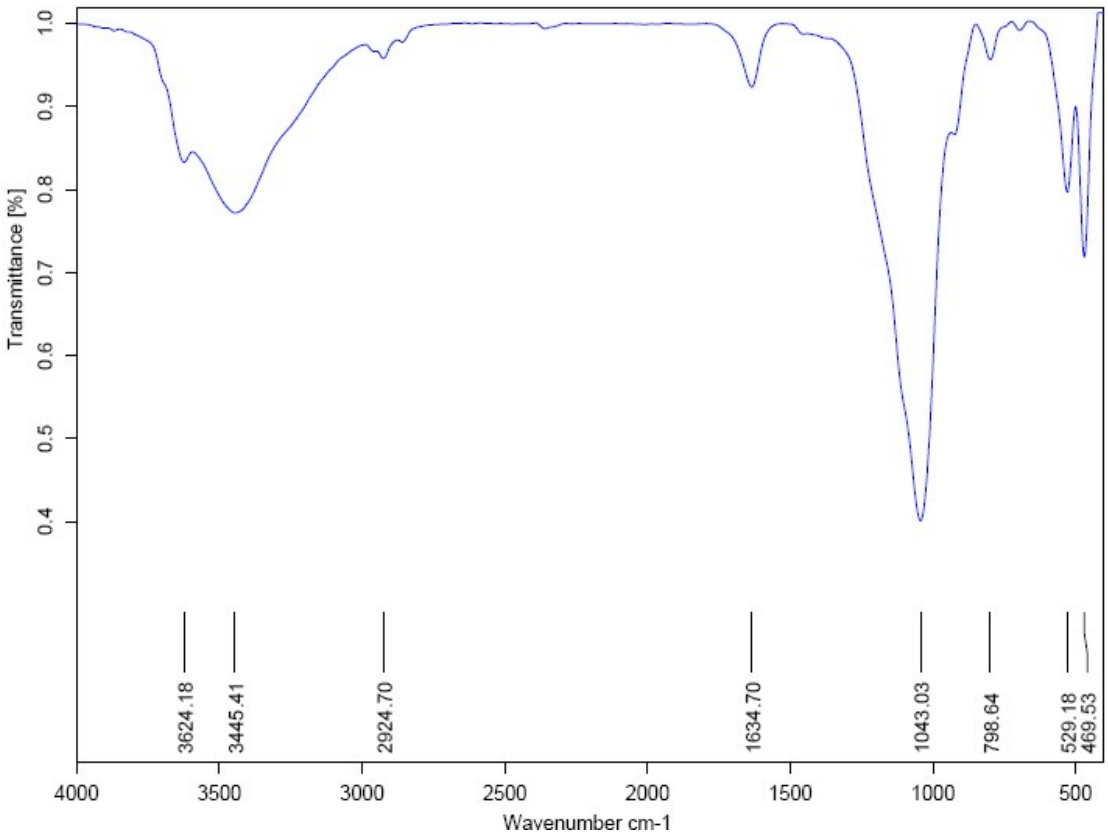


Fig. S5 FTIR spectrum of Mn oxide on montmorillonite (calcined temperature: 100 ºC).

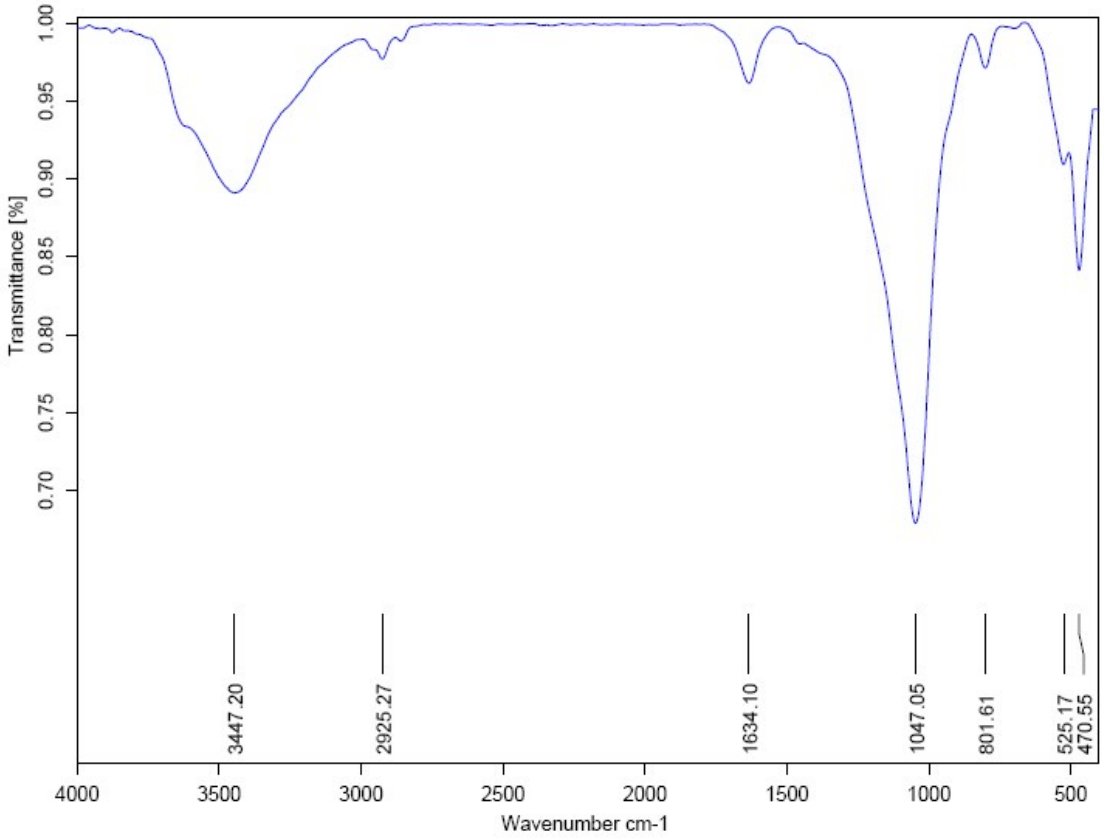


Fig. S6 FTIR spectrum of Mn oxide on montmorillonite (calcined temperature: 400 ºC).

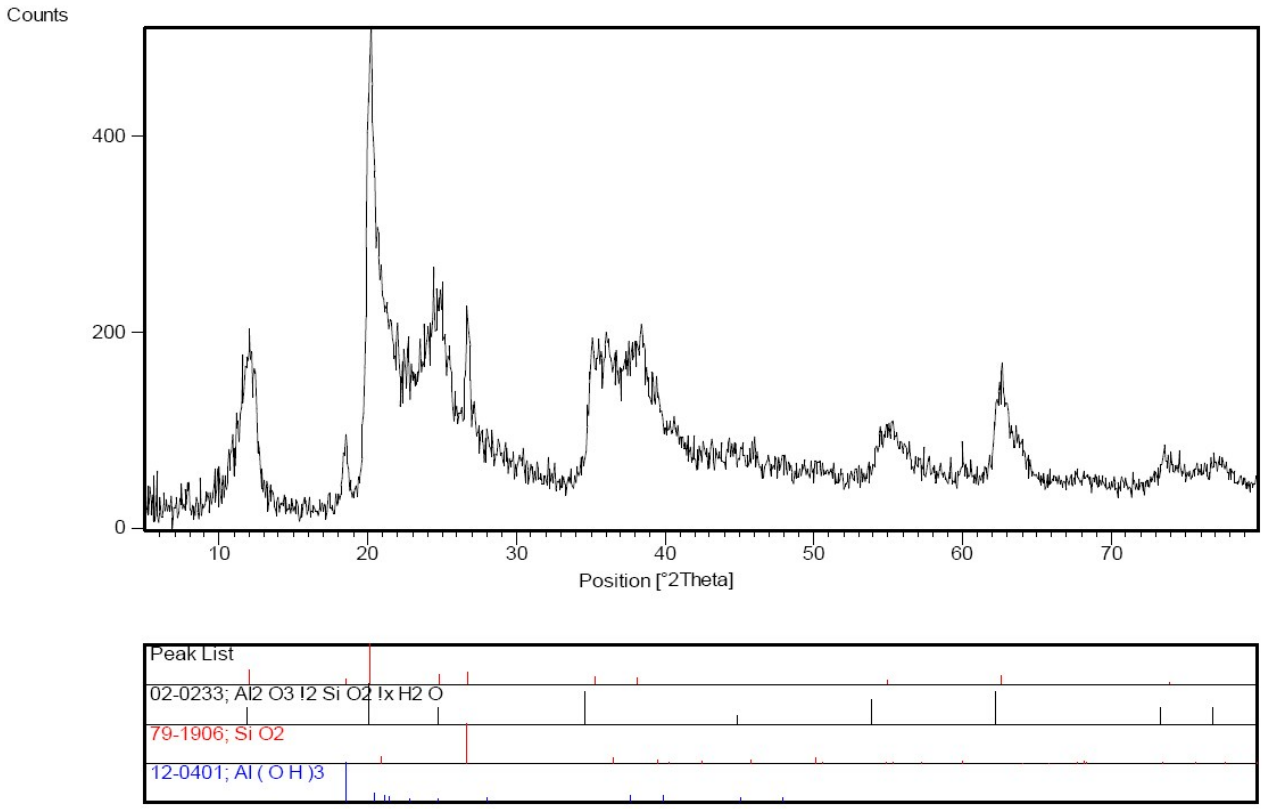


Fig. S7 XRD pattern of halloysite.

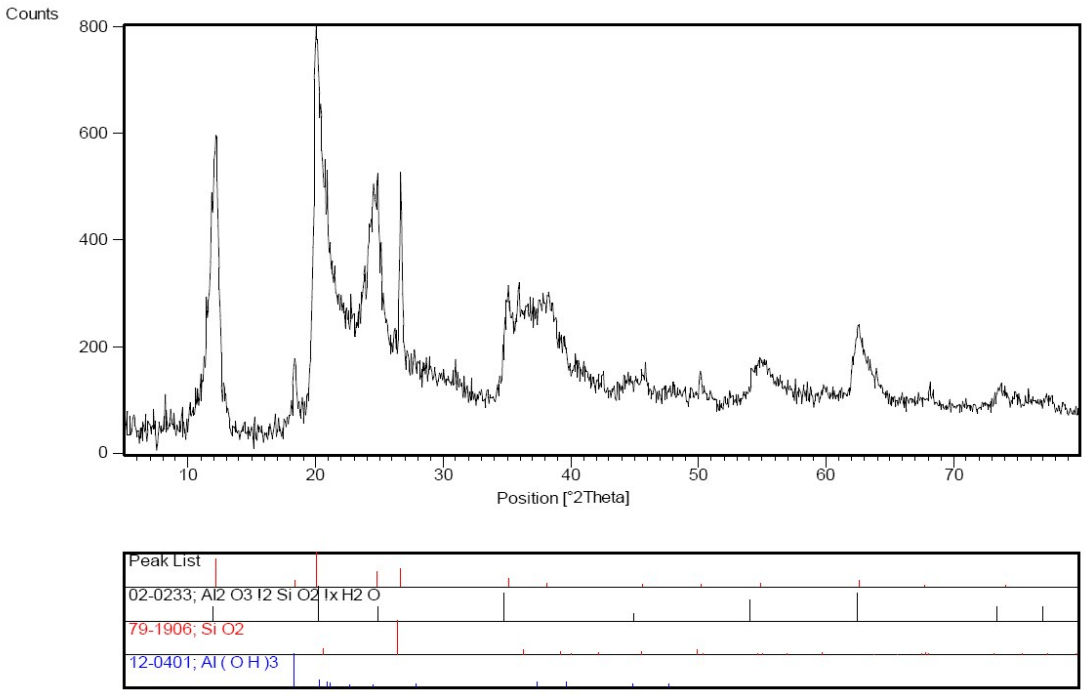


Fig. S8 XRD pattern of Mn oxide on halloysite (calcined temperature: 100 ºC).

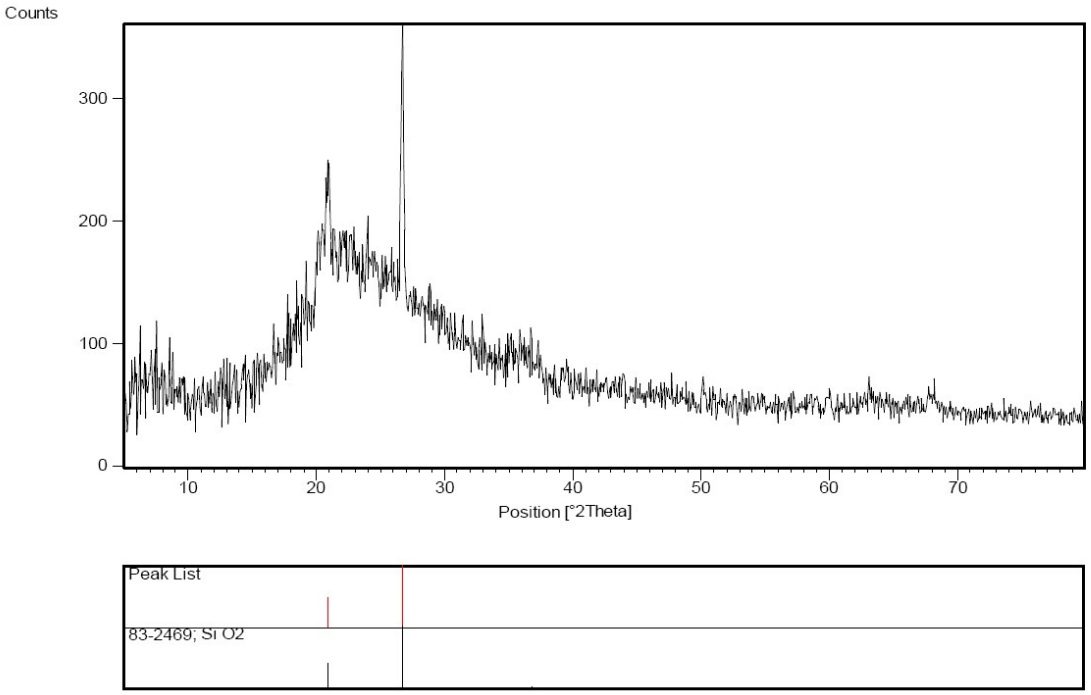


Fig. S9 XRD pattern of Mn oxide on halloysite (calcined temperature: 400 ºC).

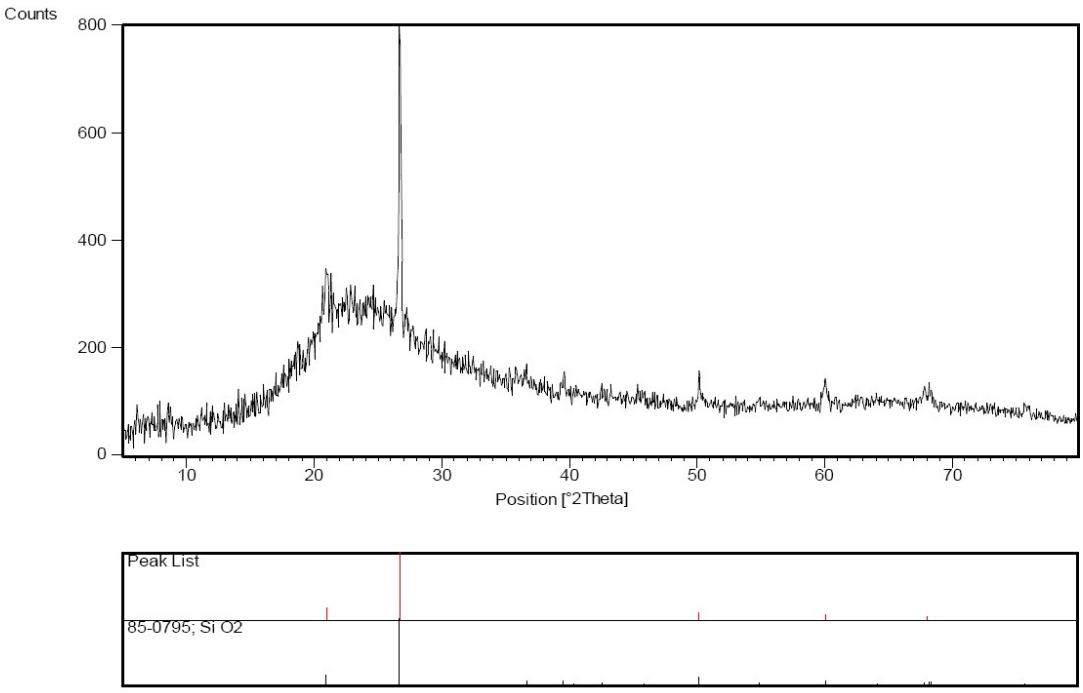


Fig. S10 XRD pattern of Mn oxide on halloysite (calcined temperature: 500 ºC).

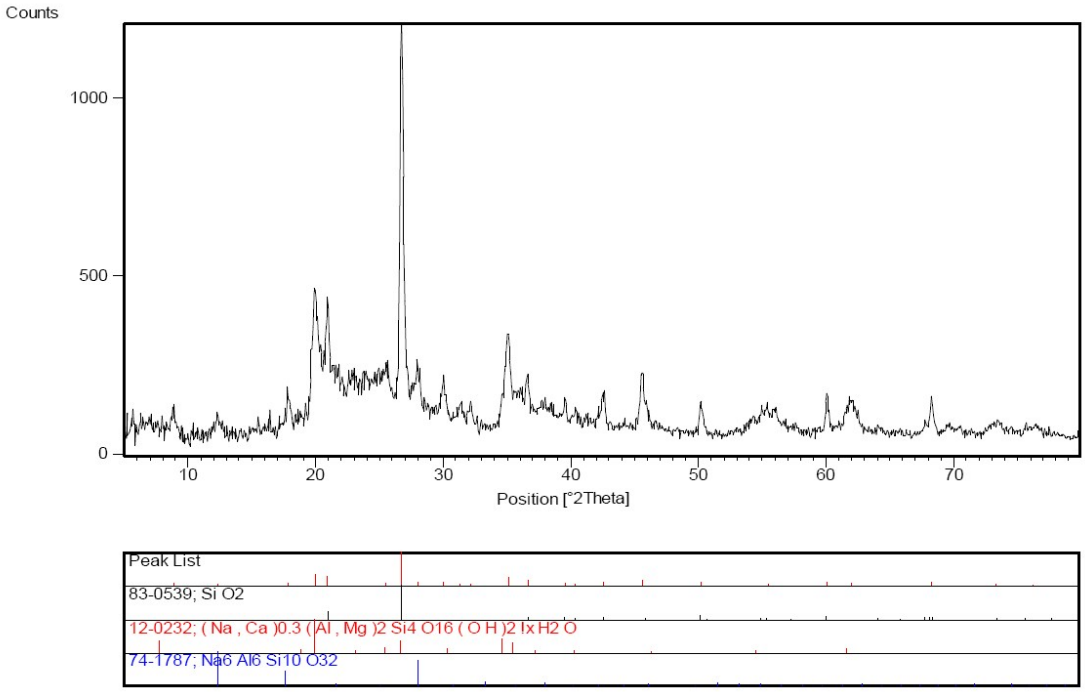


Fig. S11 XRD pattern of Mn oxide on montmorillonite.

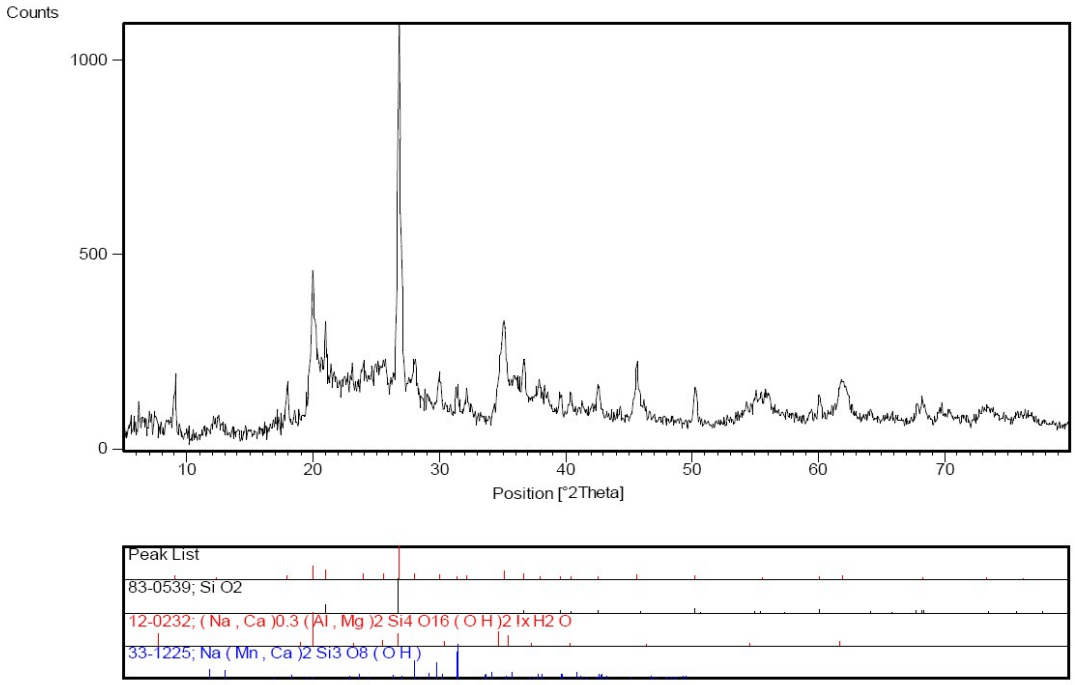


Fig. S12 XRD pattern of Mn oxide on montmorillonite (calcined temperature: 100 ºC).

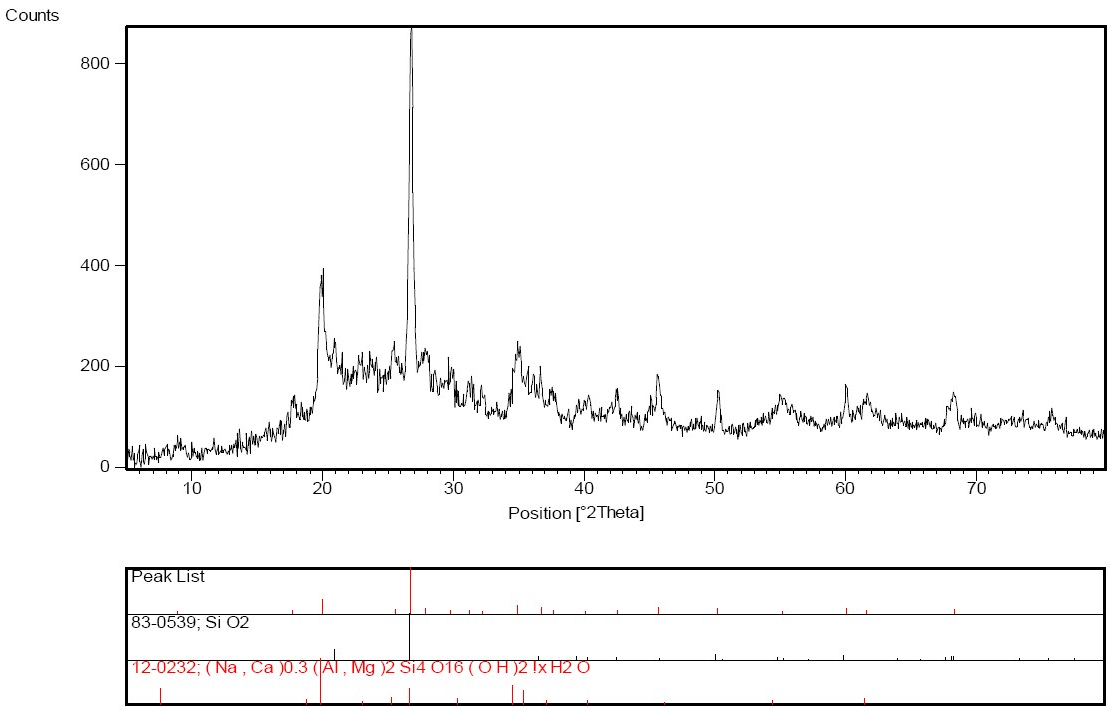
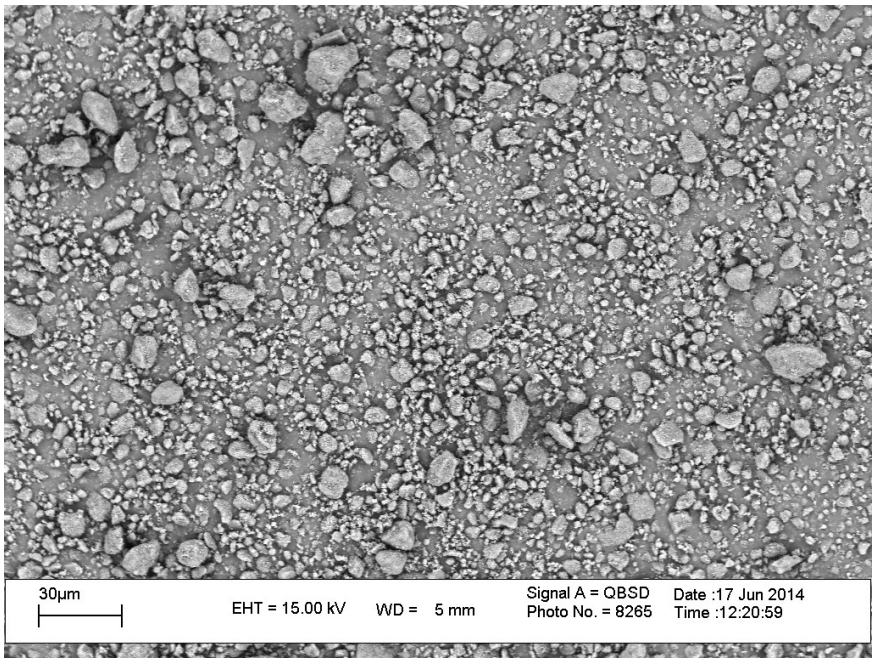


Fig. S13 XRD pattern of Mn oxide on montmorillonite (calcined temperature: 500 ºC).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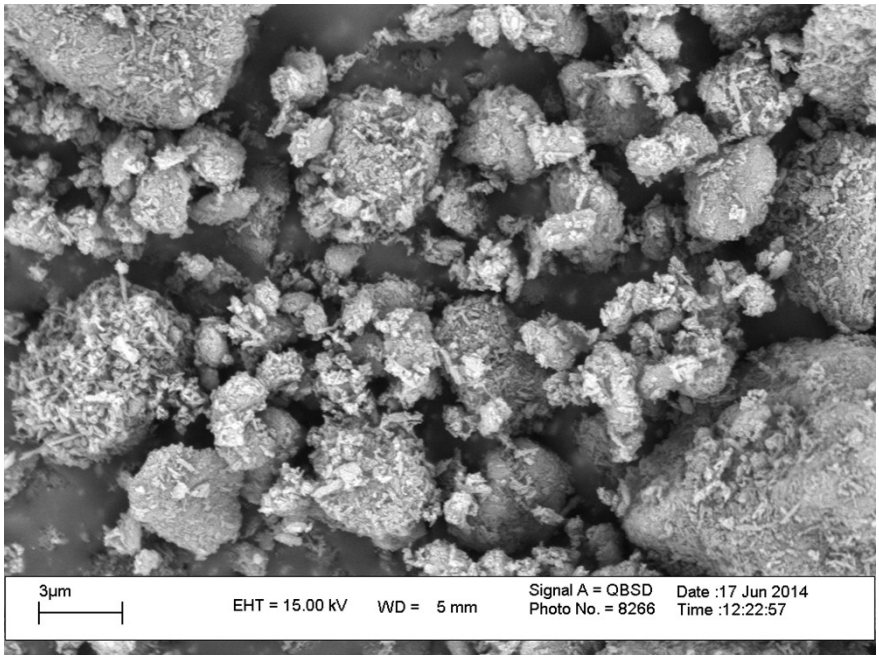
Time :12:20:59

a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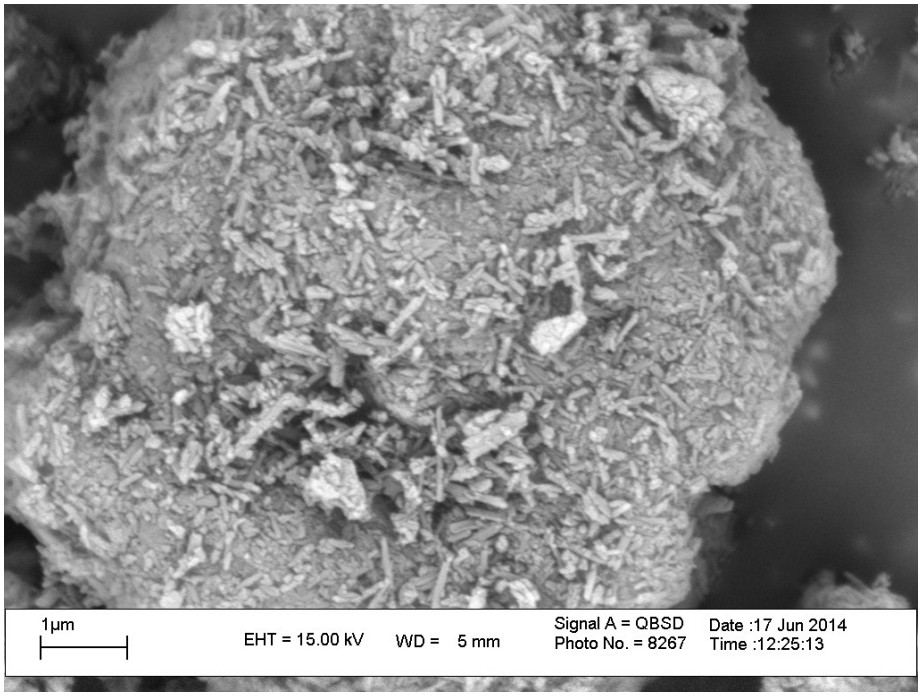

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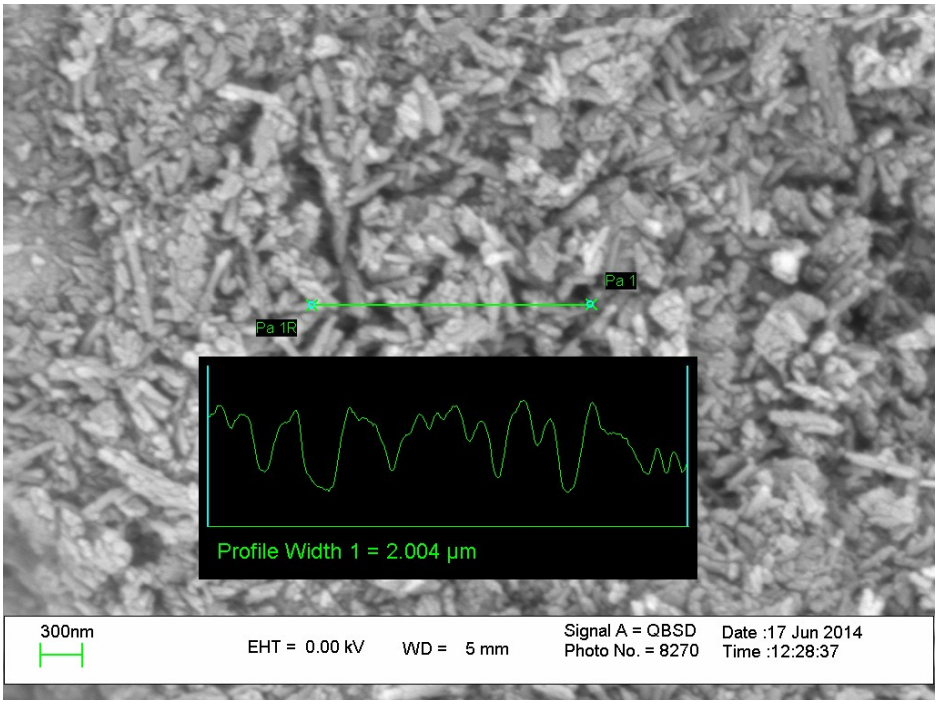
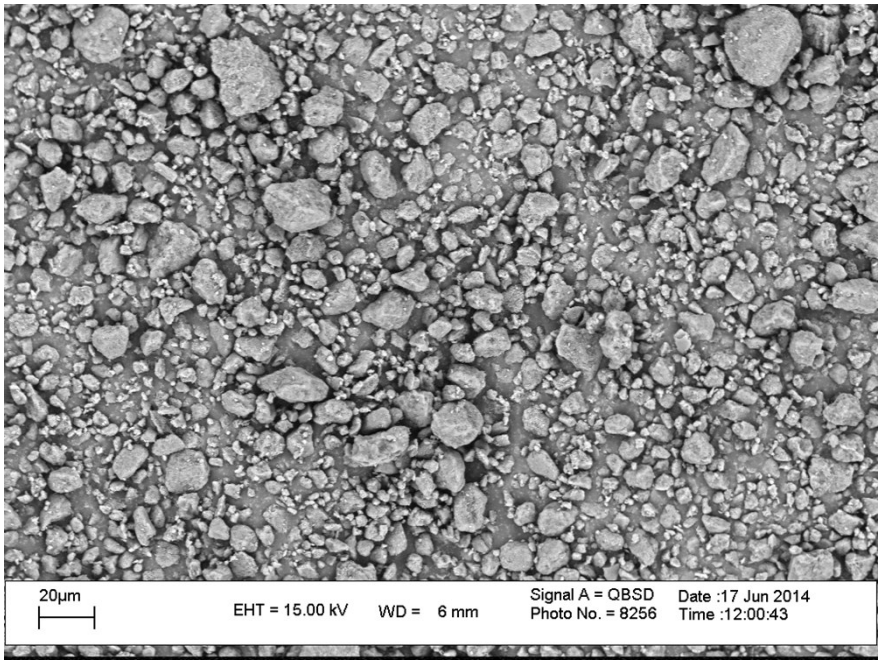


d

Fig. S14 SEM images from halloysite (a-d).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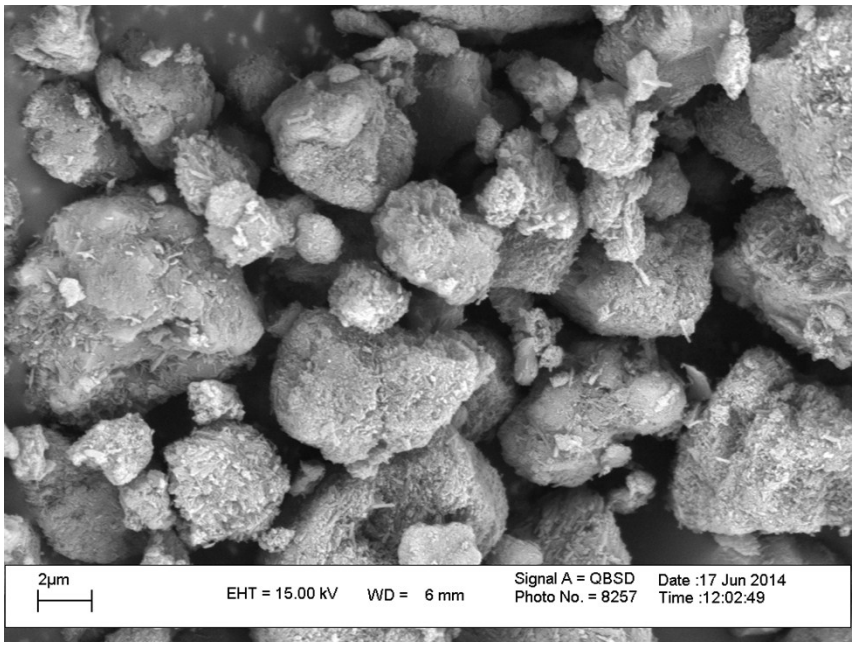
a


2µm
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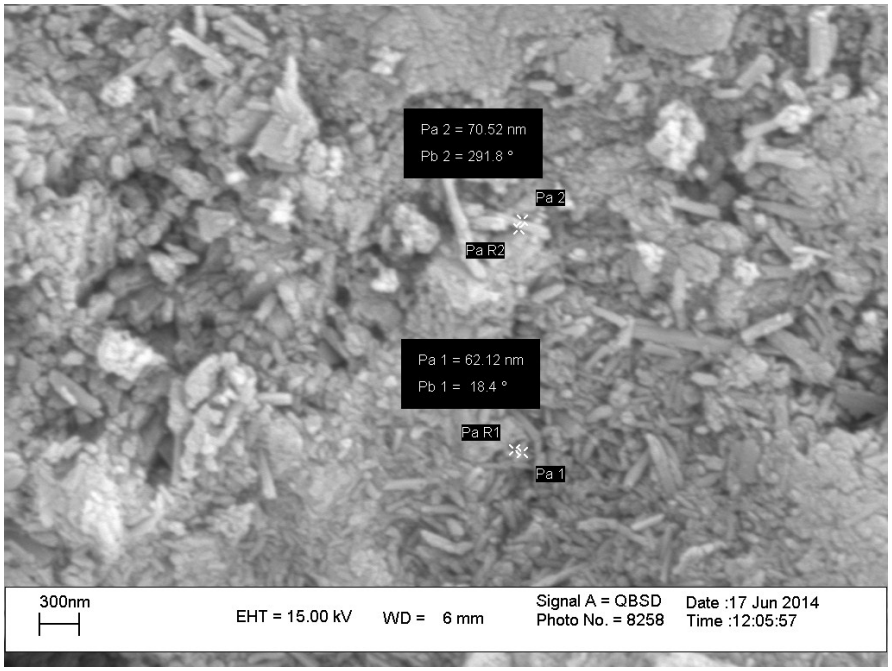
b



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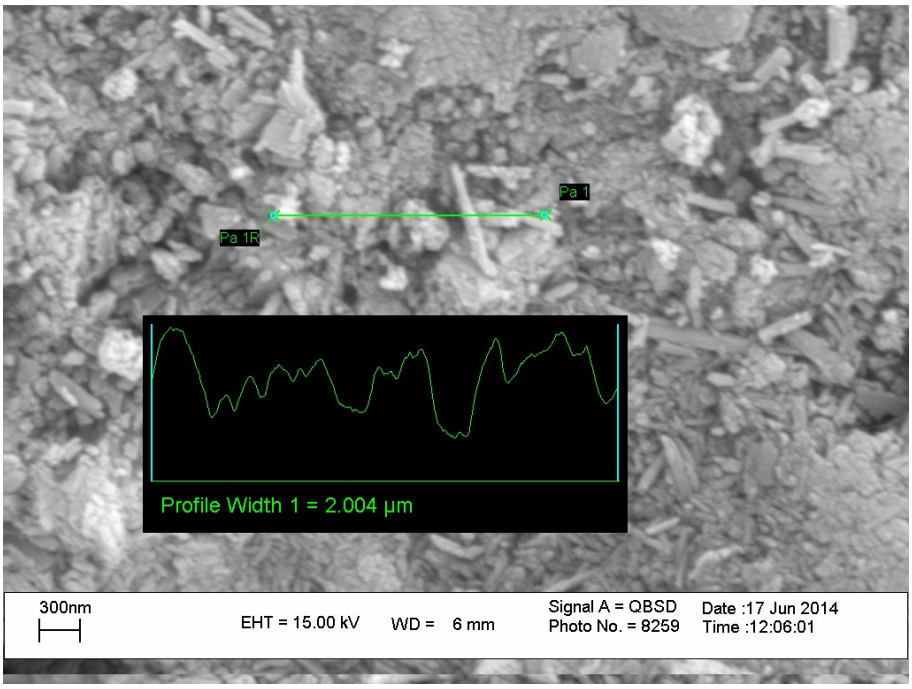
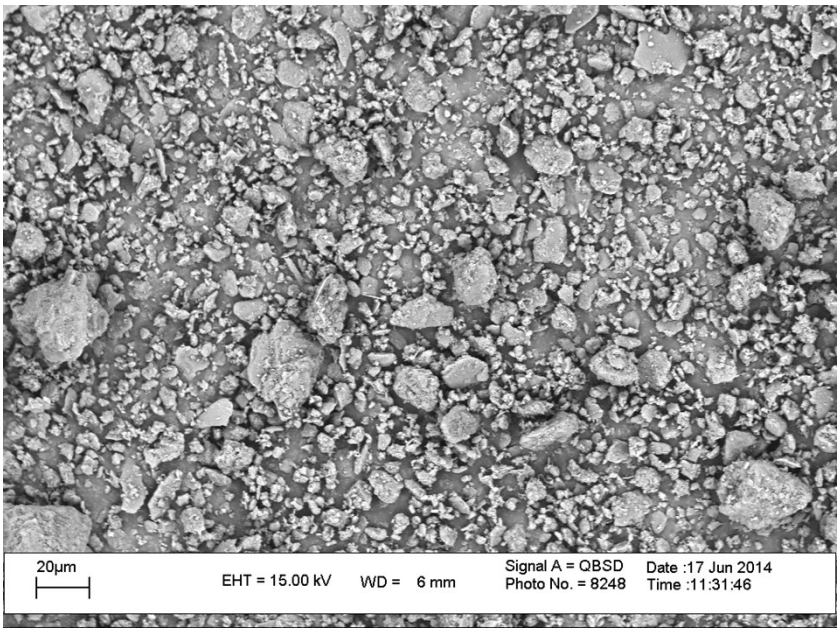


d

Fig. S15 SEM images from Mn oxide on halloysite (calcined temperature: 60 ºC) (a-d).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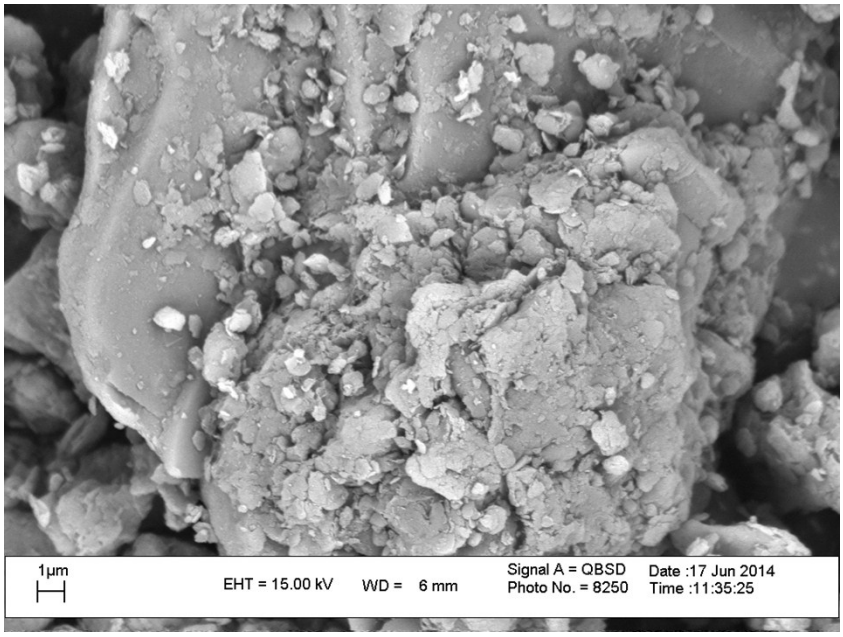
a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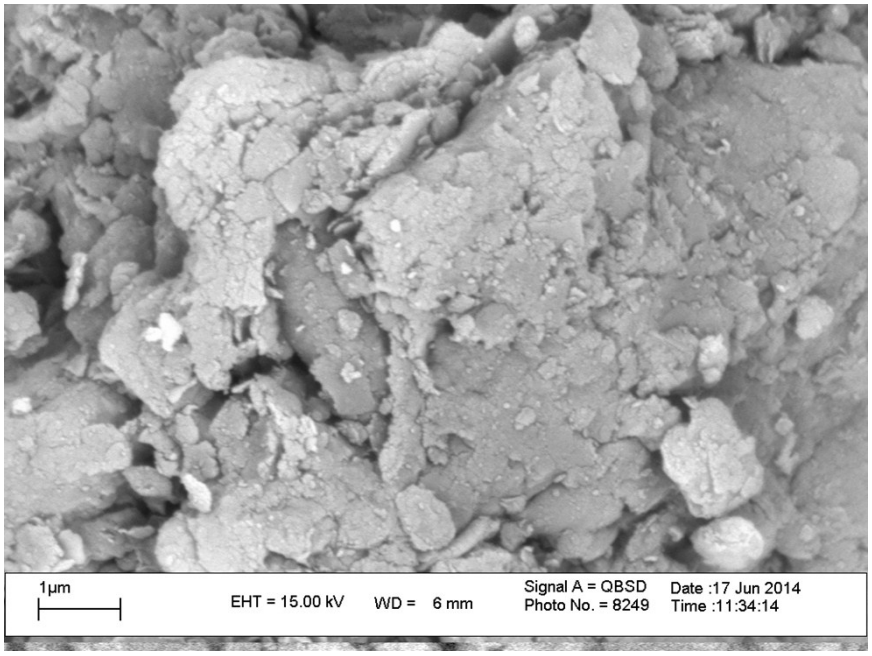
b



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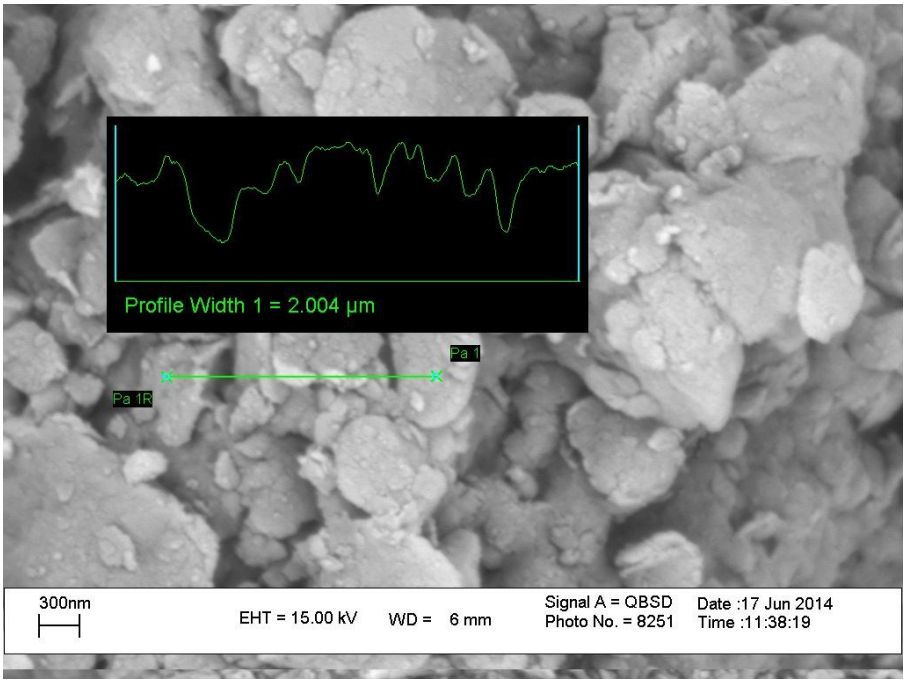
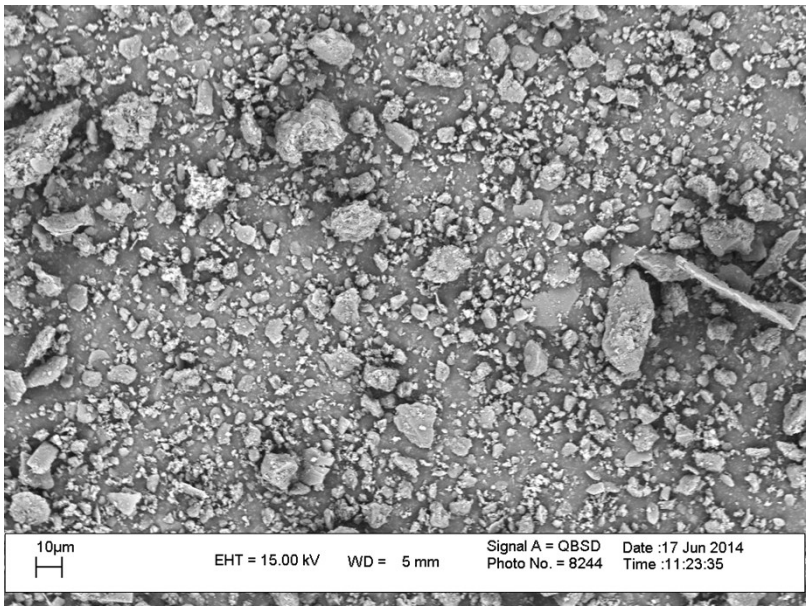


d

Fig. S16 SEM images from montmorillonite (a-d).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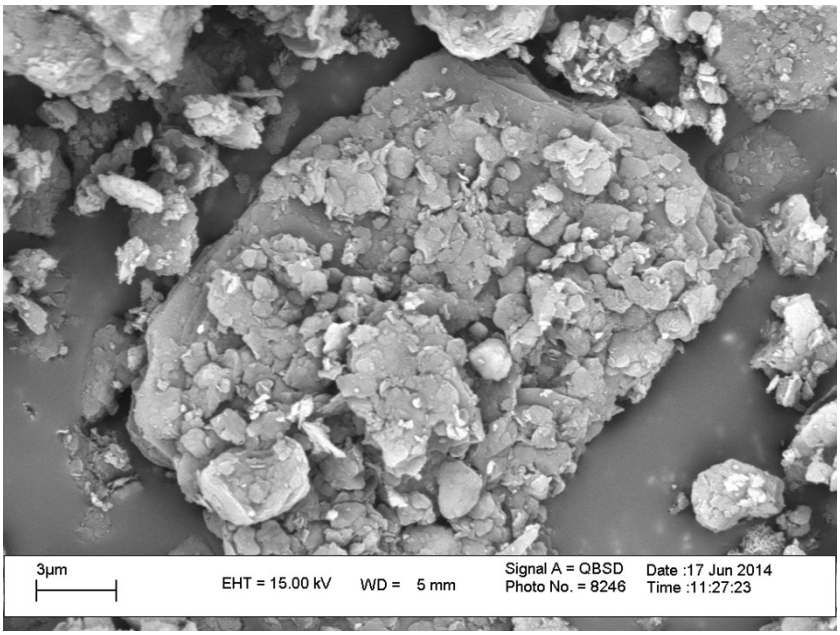
Time :11:23:35

a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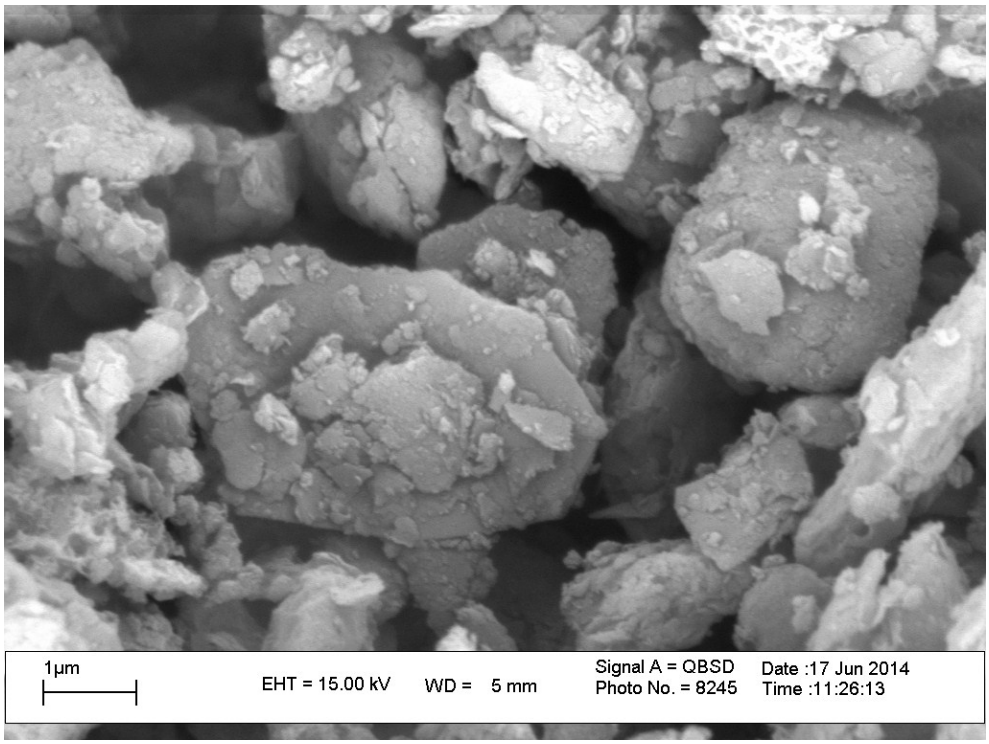
b



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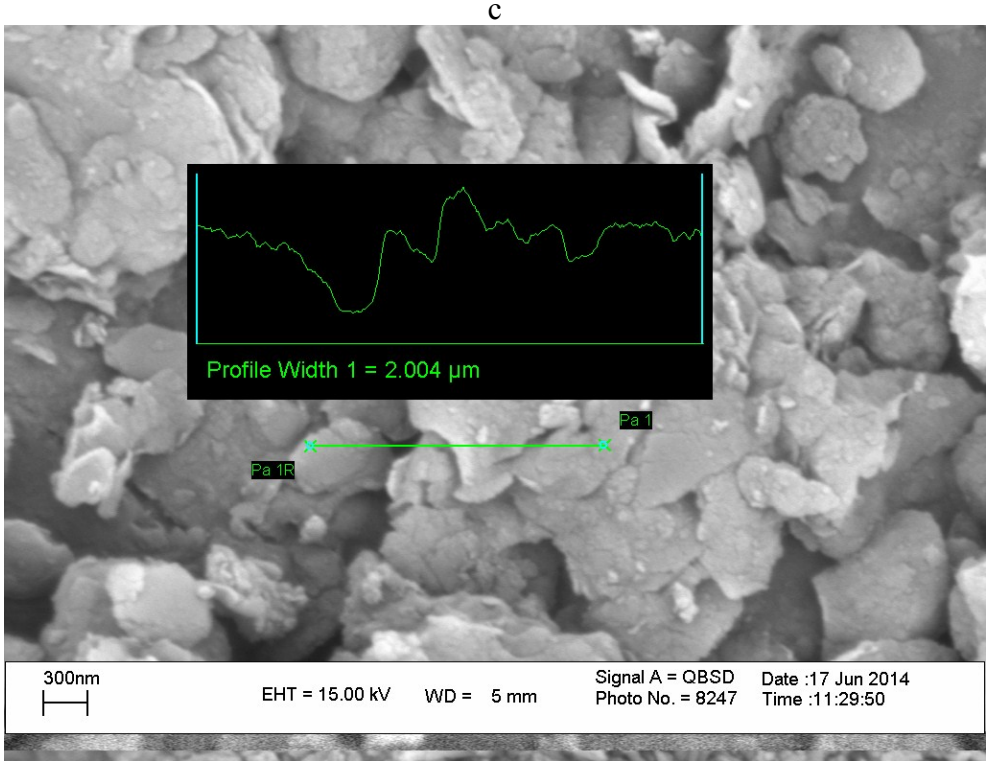
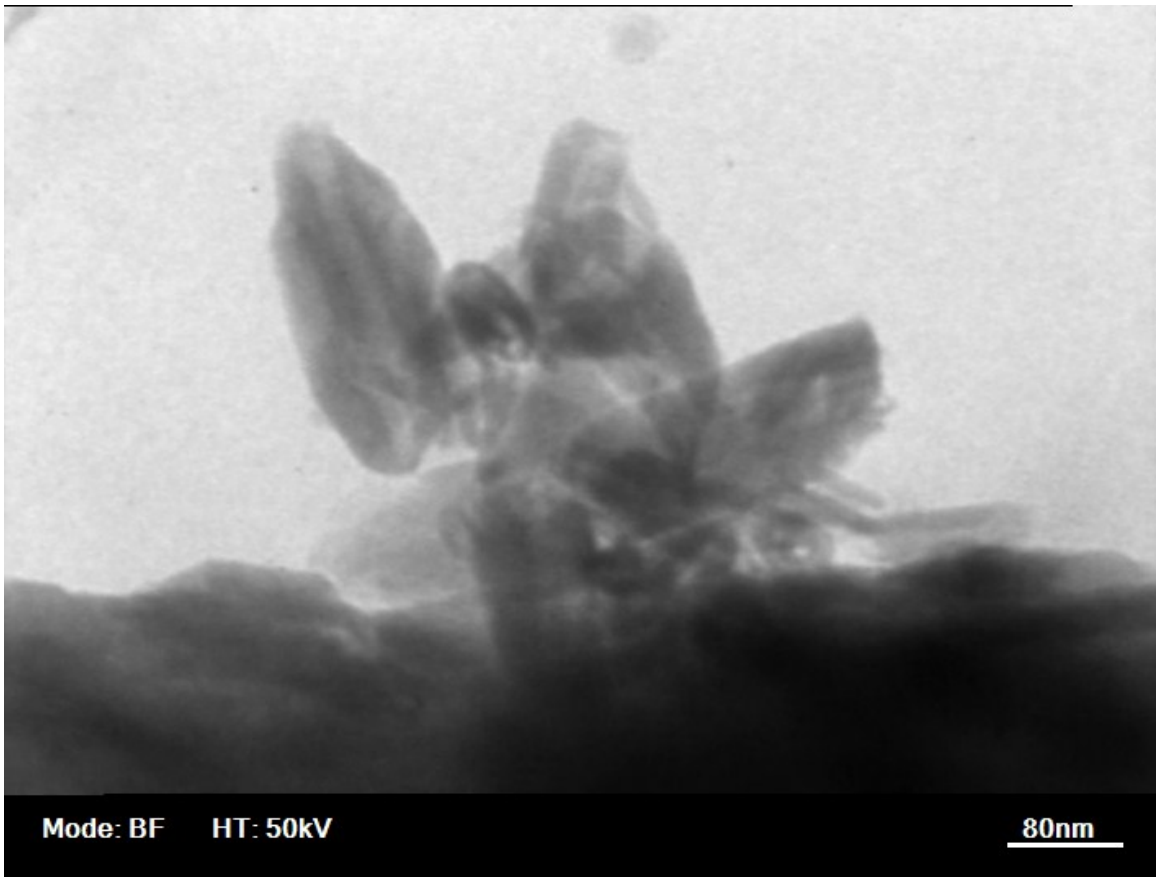


d

Fig. S17 SEM images of Mn oxide on montmorillonite (calcined temperature: 60 ºC) (a-d).



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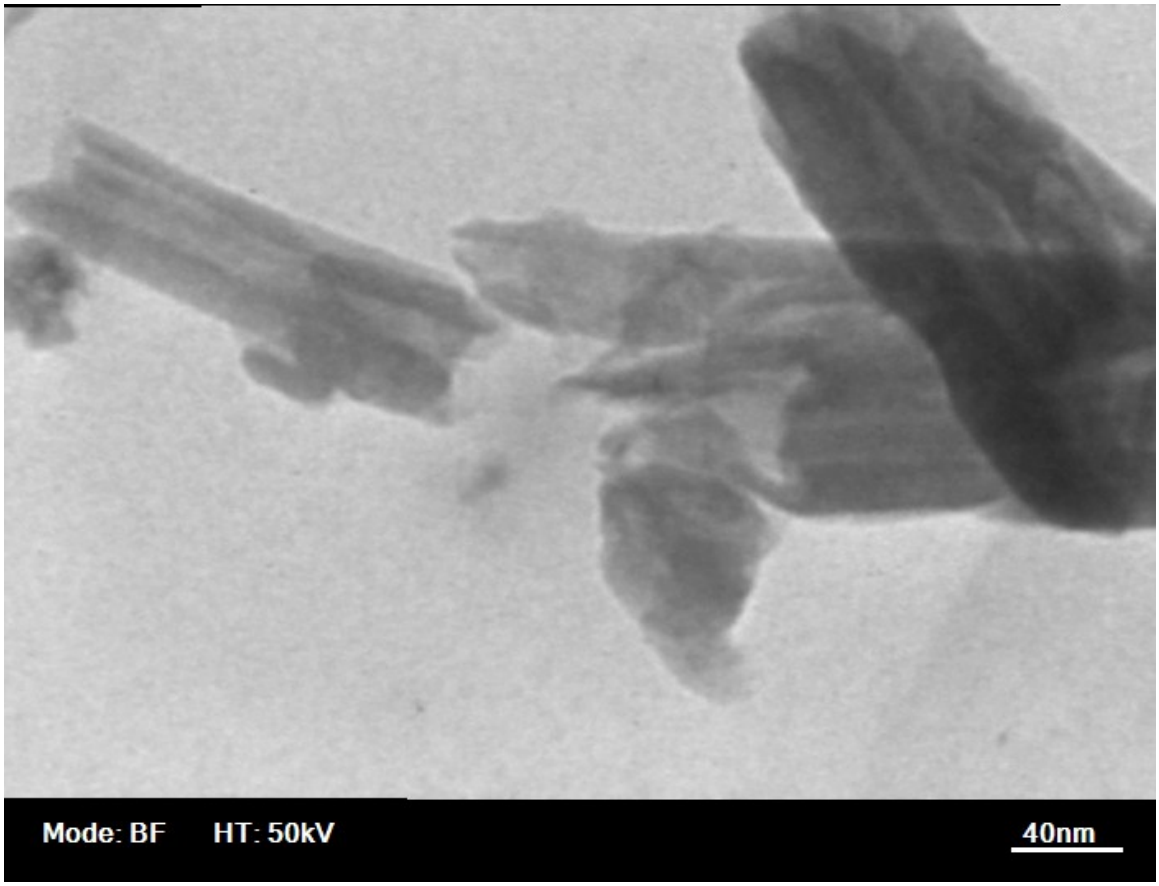

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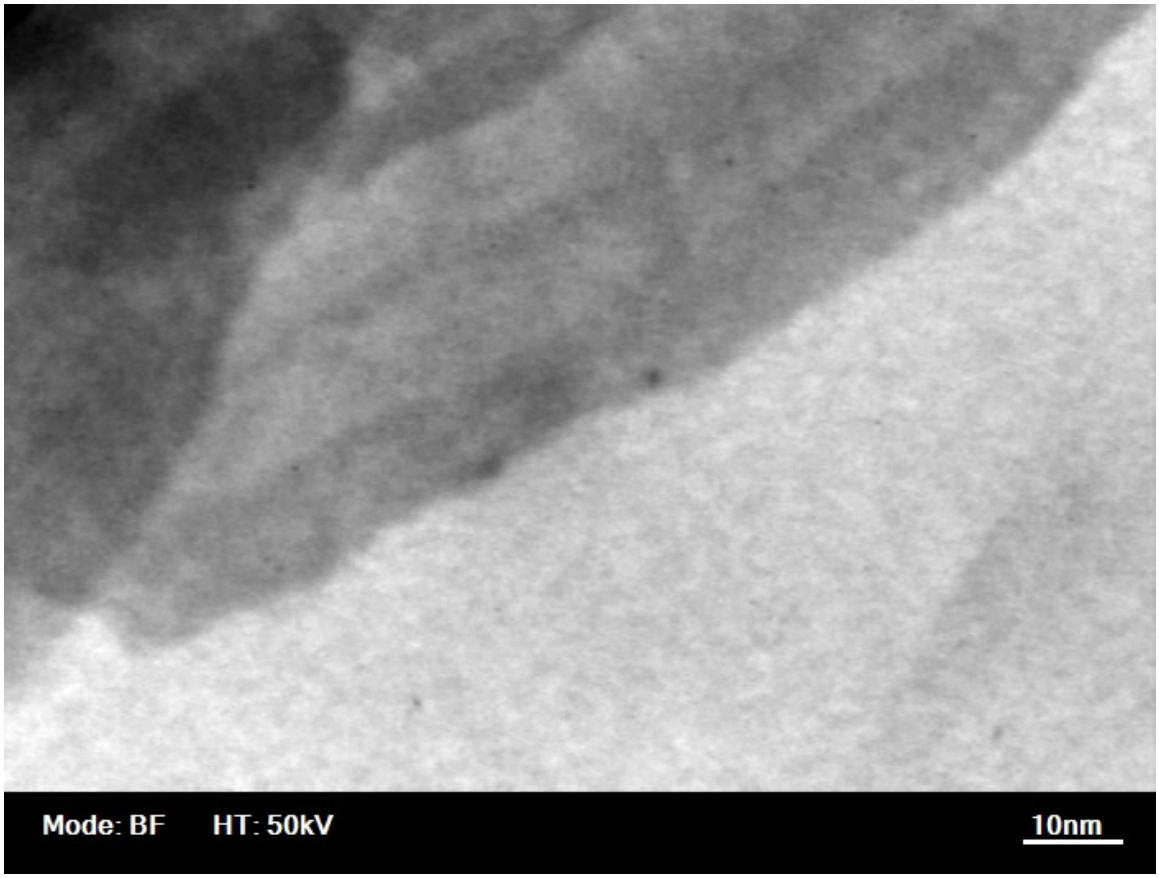
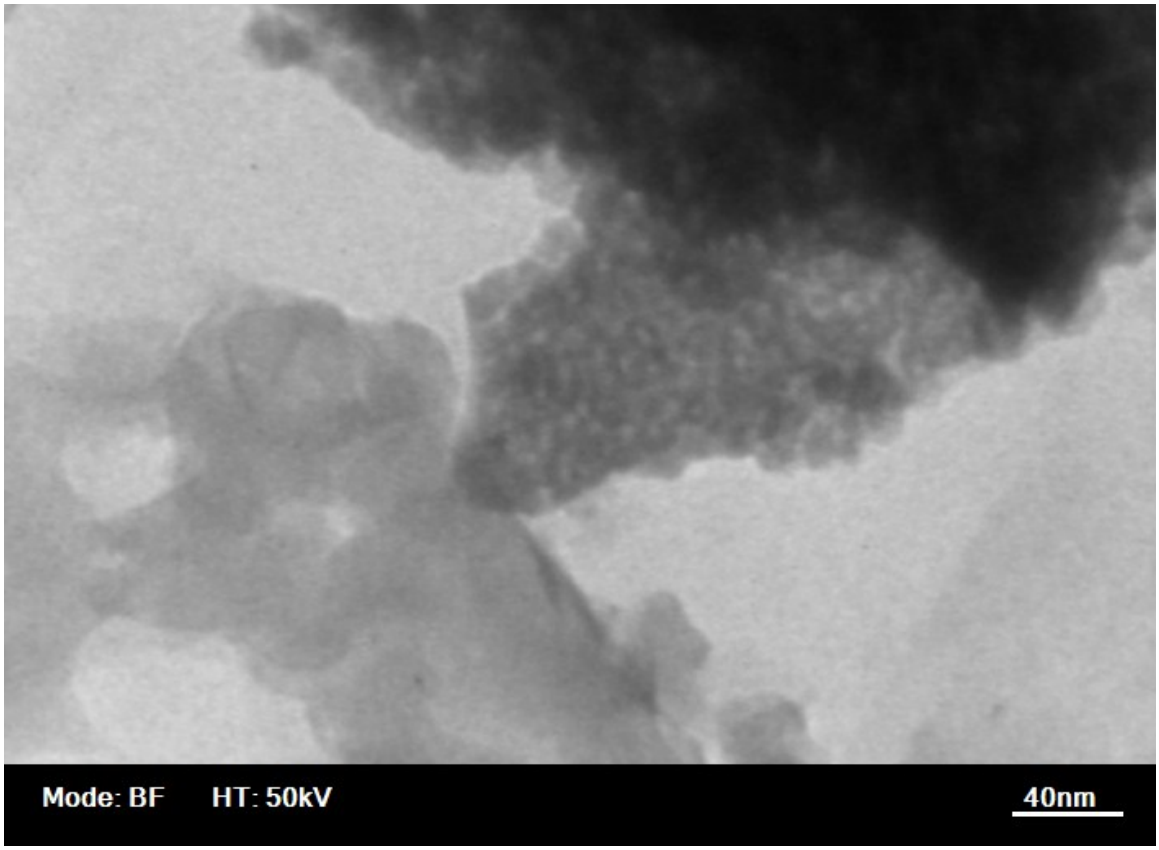
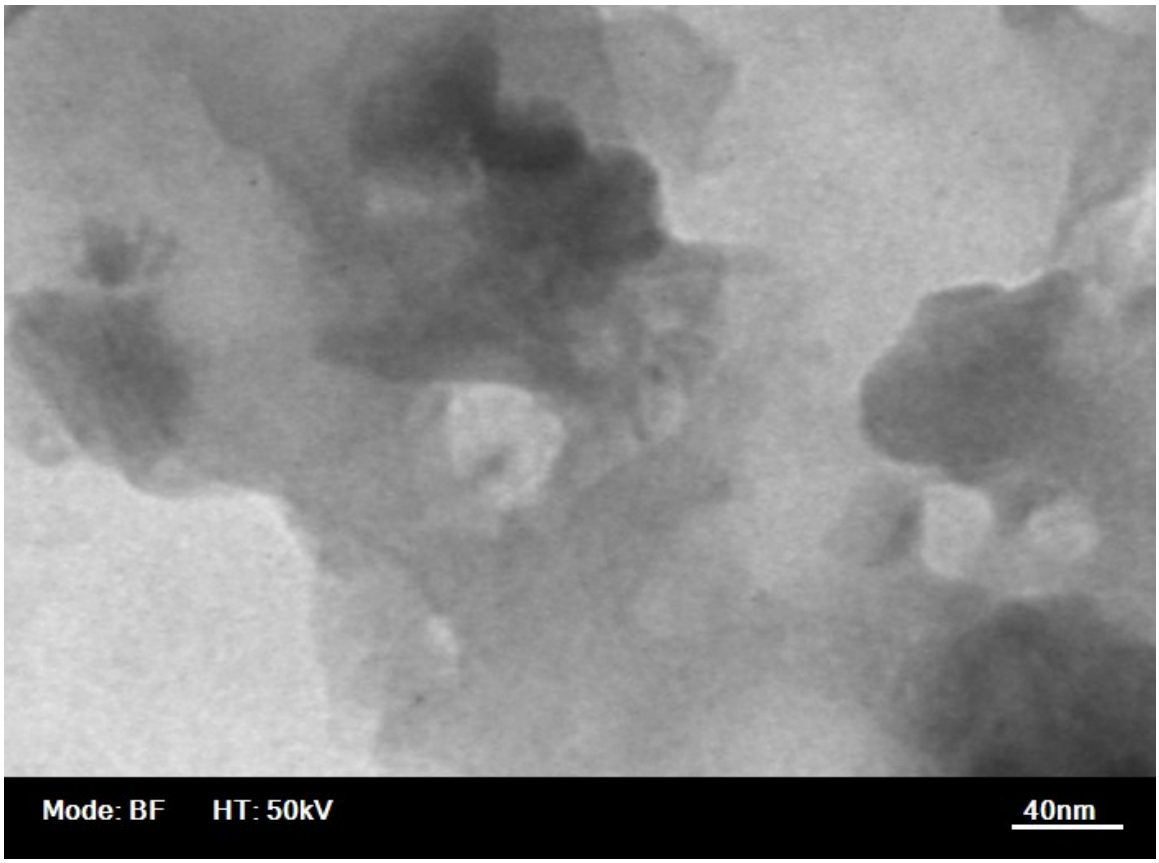


d

Fig. S18 TEM images of Mn oxide on halloysite (calcined temperature: 60 ºC) (a-d).



a



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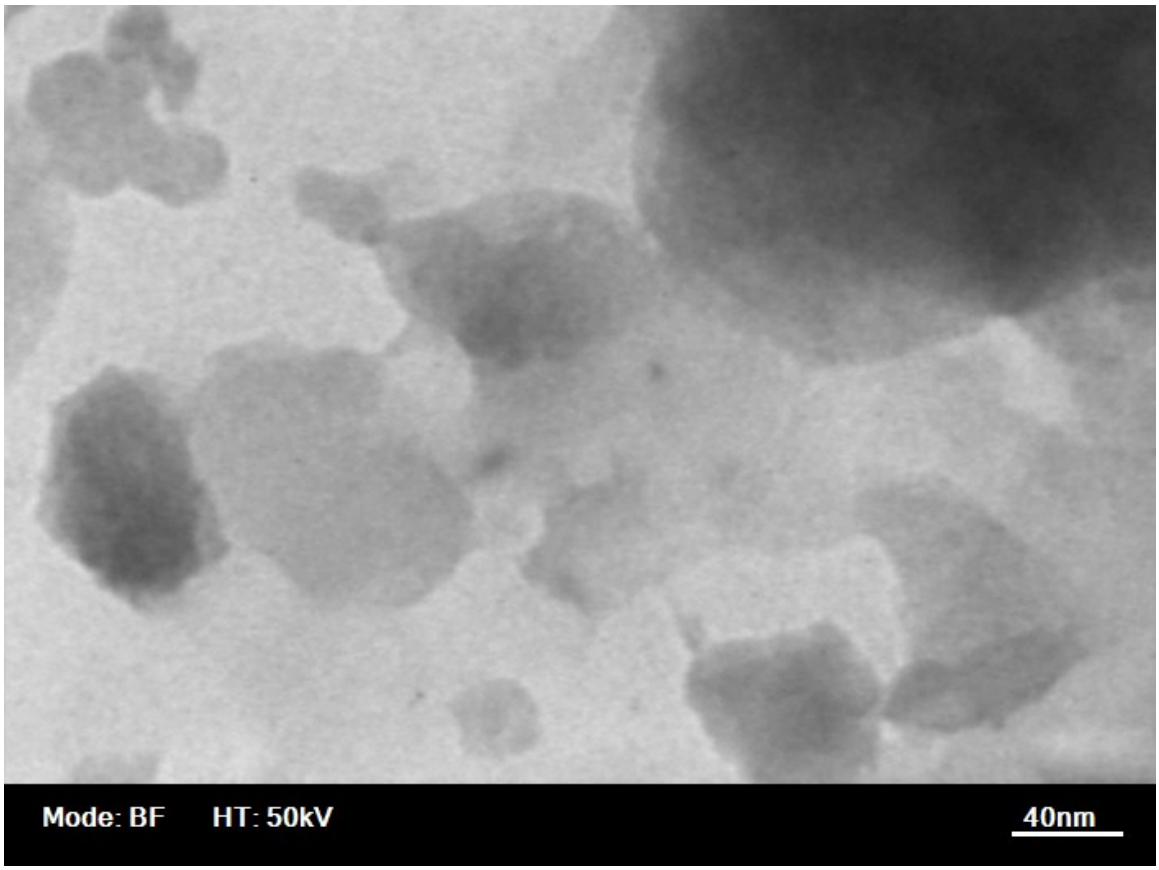

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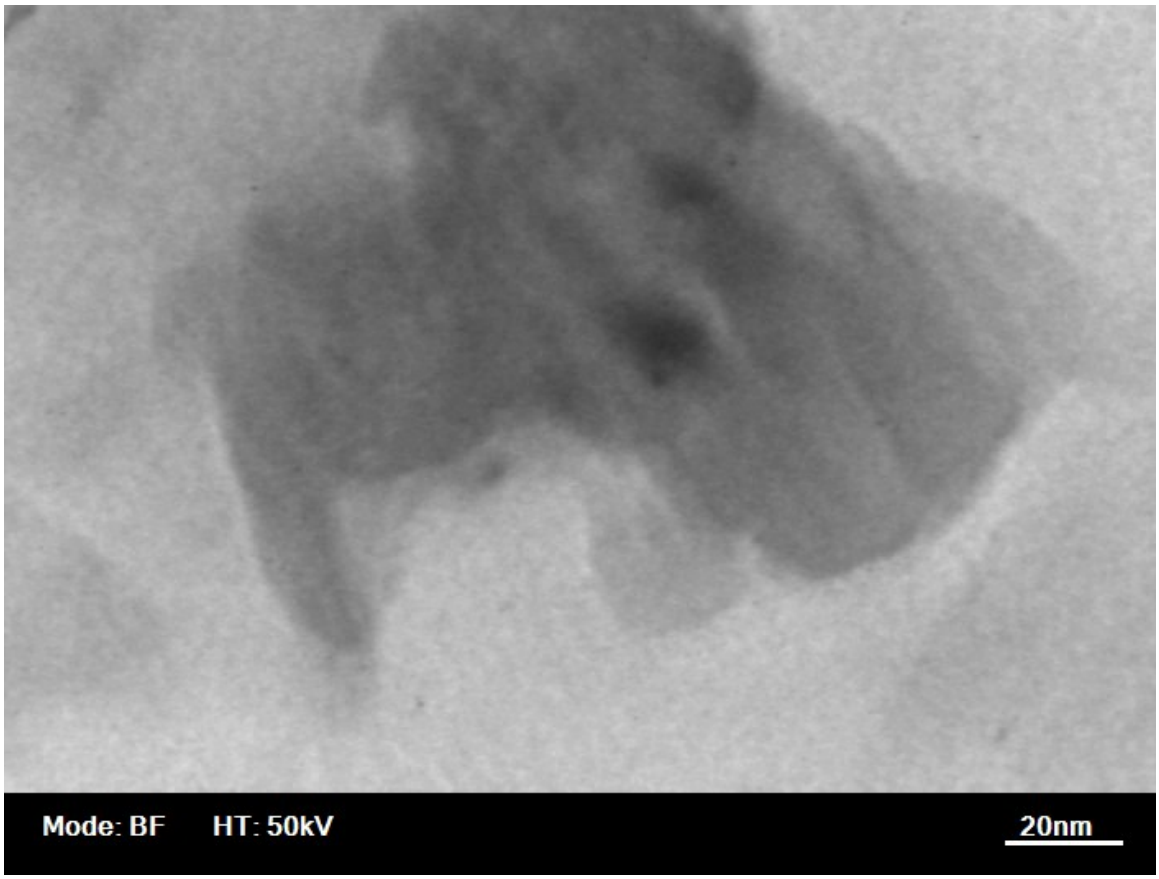
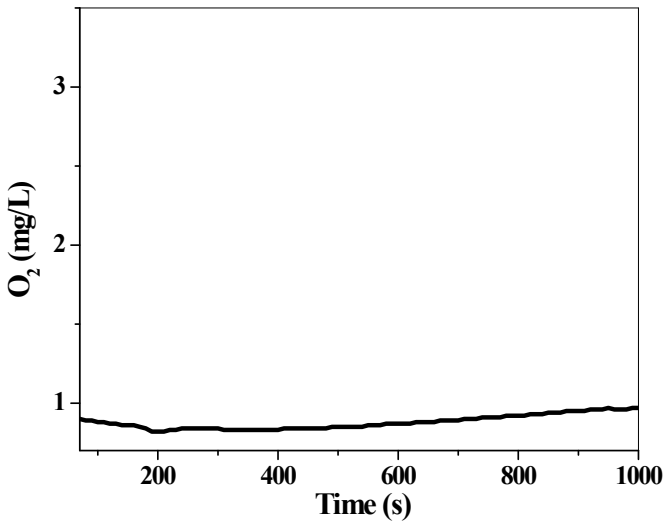
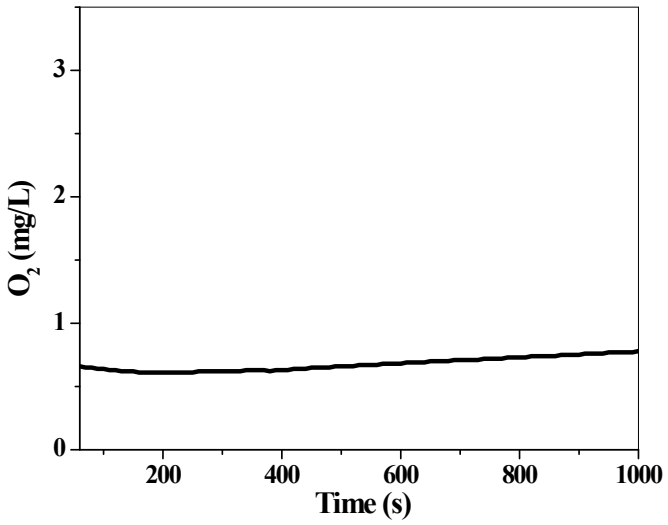


d

Fig. S19 TEM images of Mn oxide on montmorillonite (calcined temperature: 60 ºC) (a-d).



a



b

Fig. S20 The rate of oxygen evolution in the presence of 50 mg halloysite (a) and montmorillonite (b) (50 mg) ([Ce(IV)]: 0.11 M).