Electronic Supplementary Material (ESI) for Dalton Transactions.

Electronic Supplementary Information

Nanolayered manganese oxide/C_{60} composite: A good water-oxidizing catalyst for artificial photosynthetic systems

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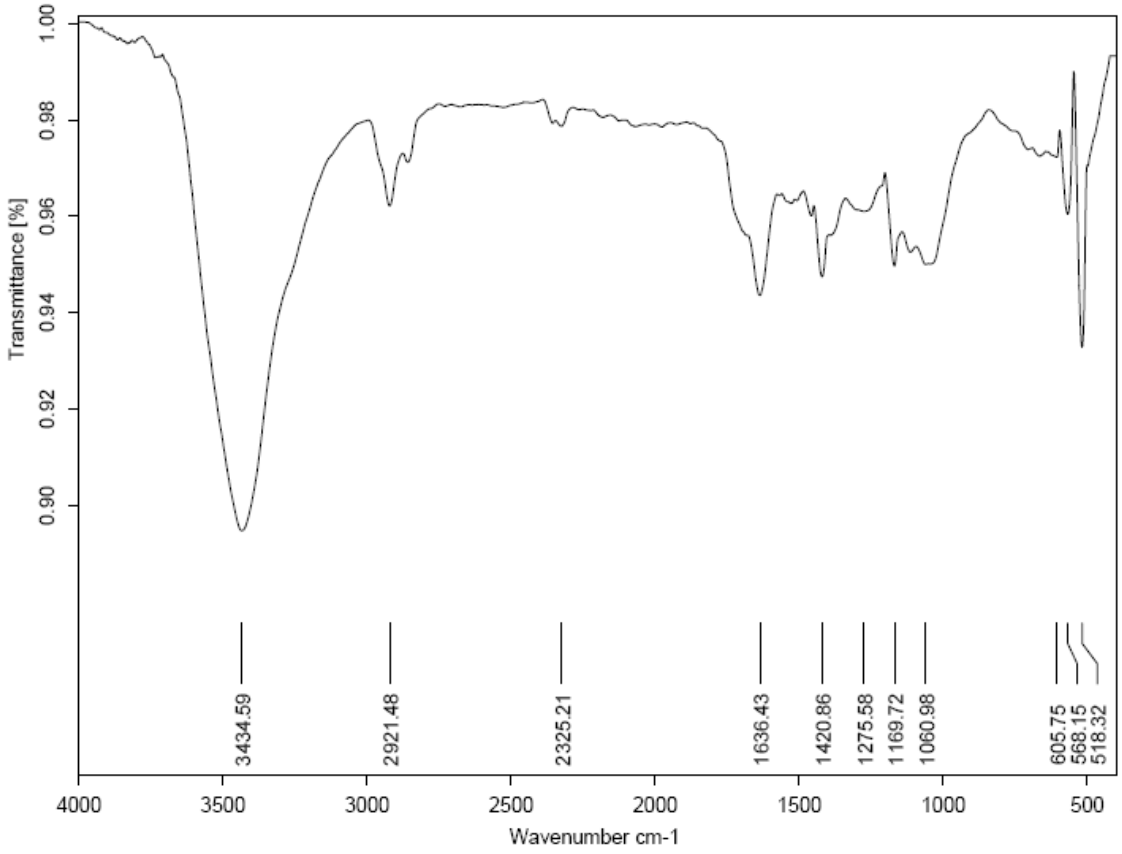
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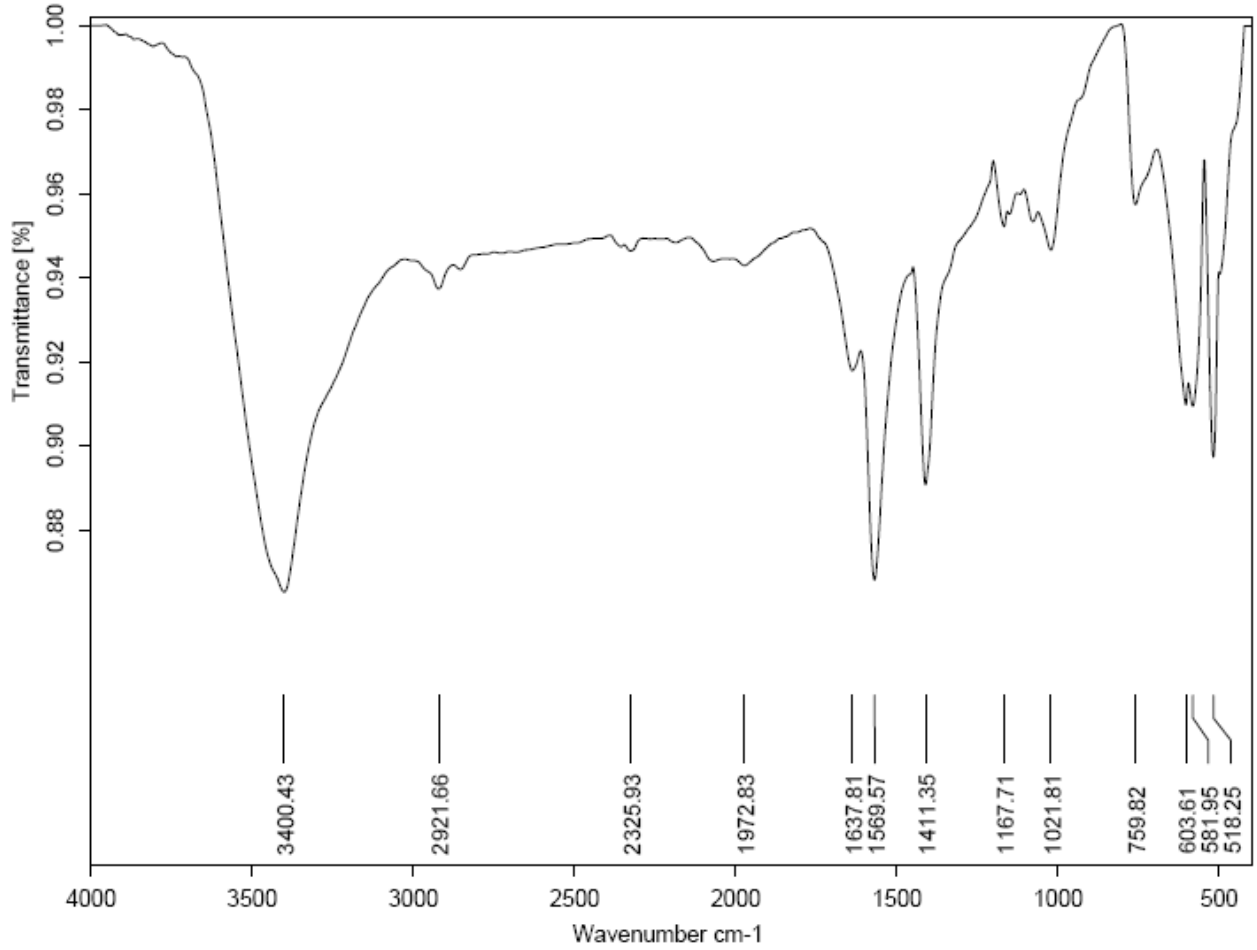
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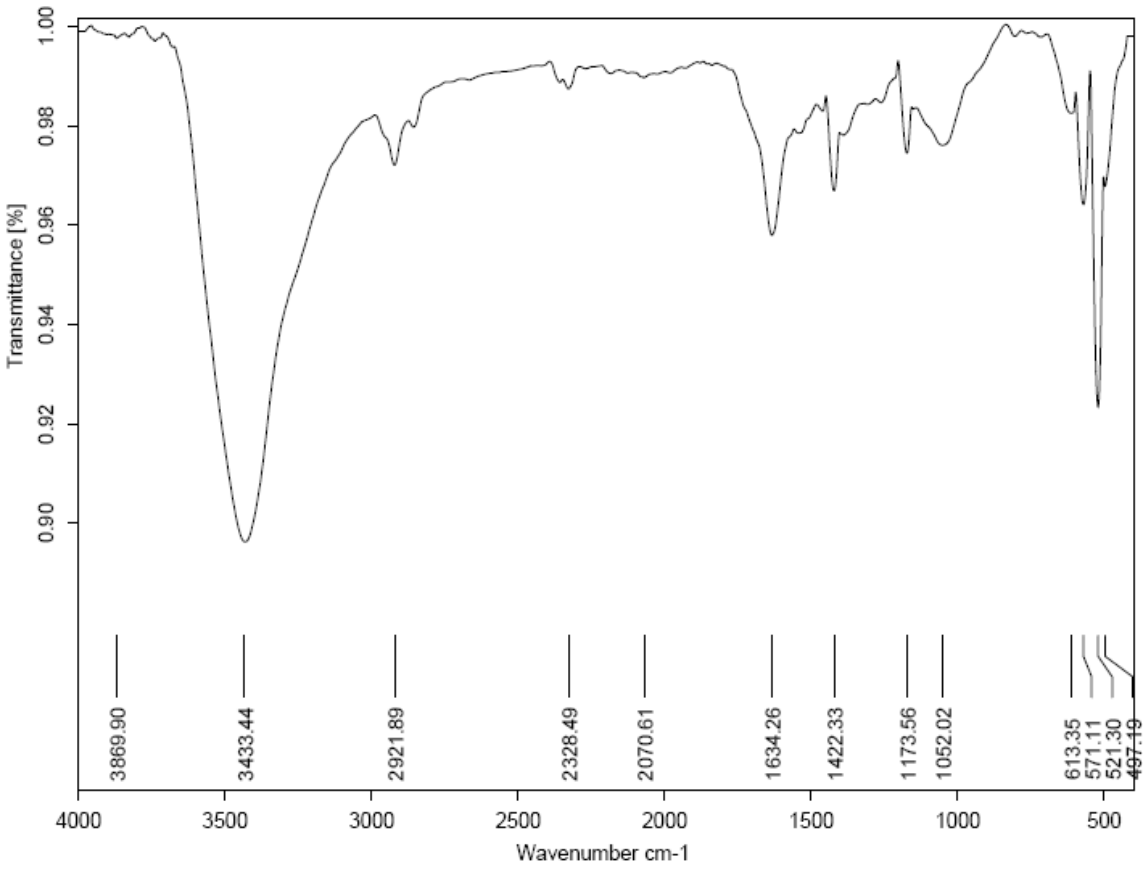
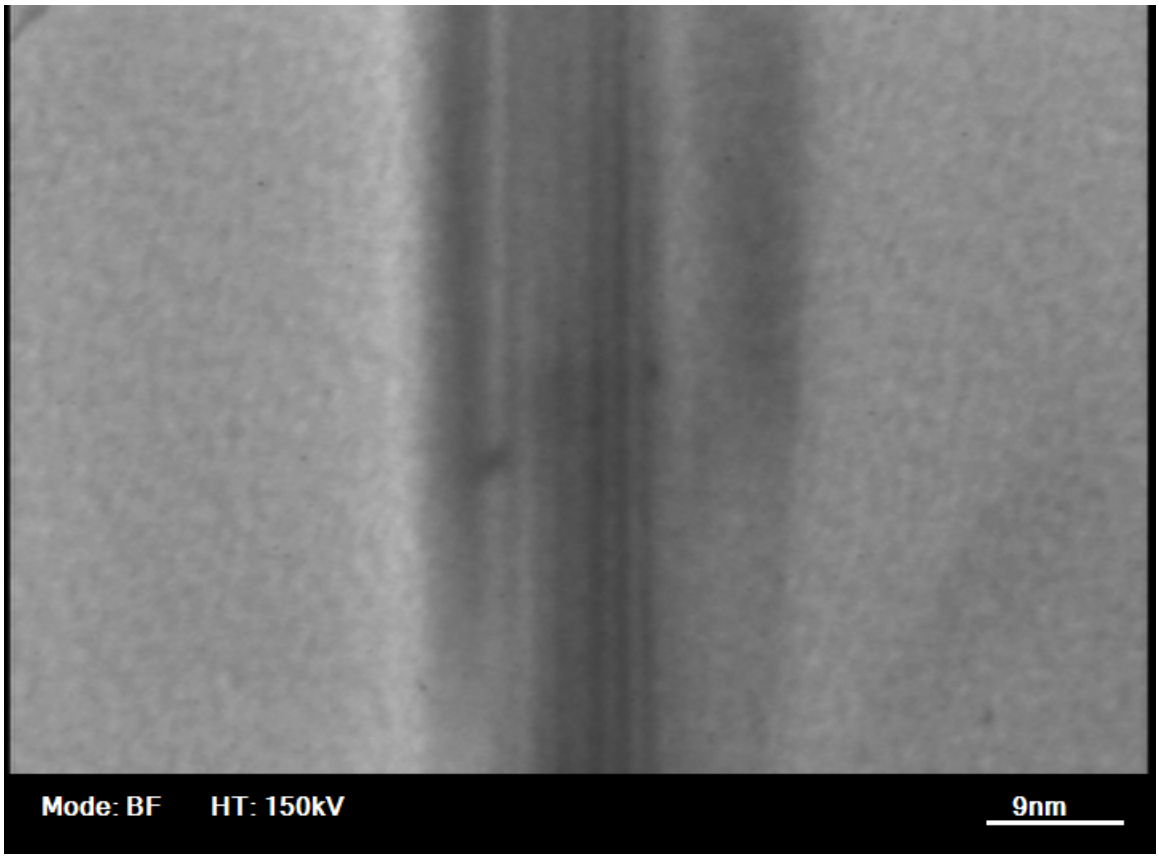


c

Fig. S1 FTIR spectra of C_{60} (a), **1** (b) and **2** (c). A broad band at ~ 3200 - 3500 cm^{-1} related to antisymmetric and symmetric O-H stretchings is observed. ~ 1630 cm^{-1} is related to H-O-H bending. The absorption bands characteristic for a MnO_6 core in the region ~ 600 cm^{-1} assigned to stretching vibrations of Mn-O bonds in Mn oxide was also observed in the FTIR spectra of **1**. However, peaks related to MnO_6 core were not observed for **2** because of low amounts of Mn oxide in the composite.



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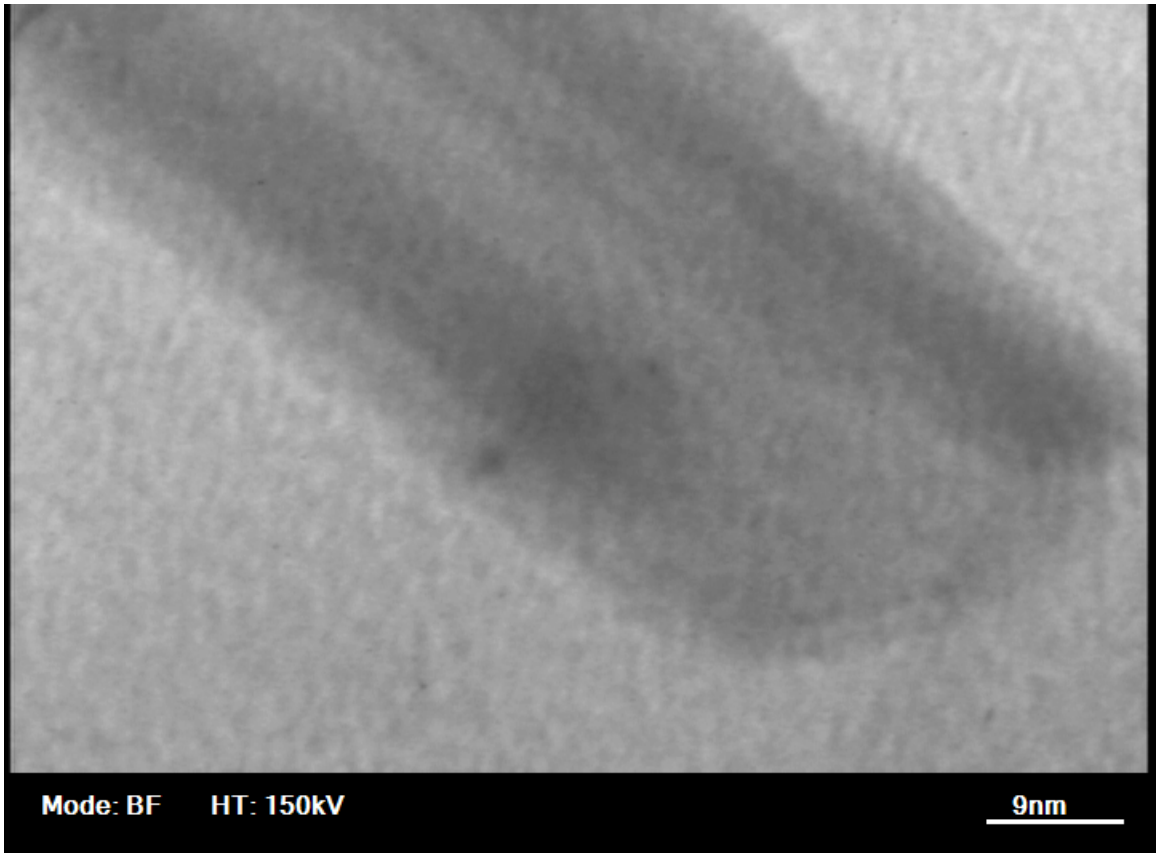

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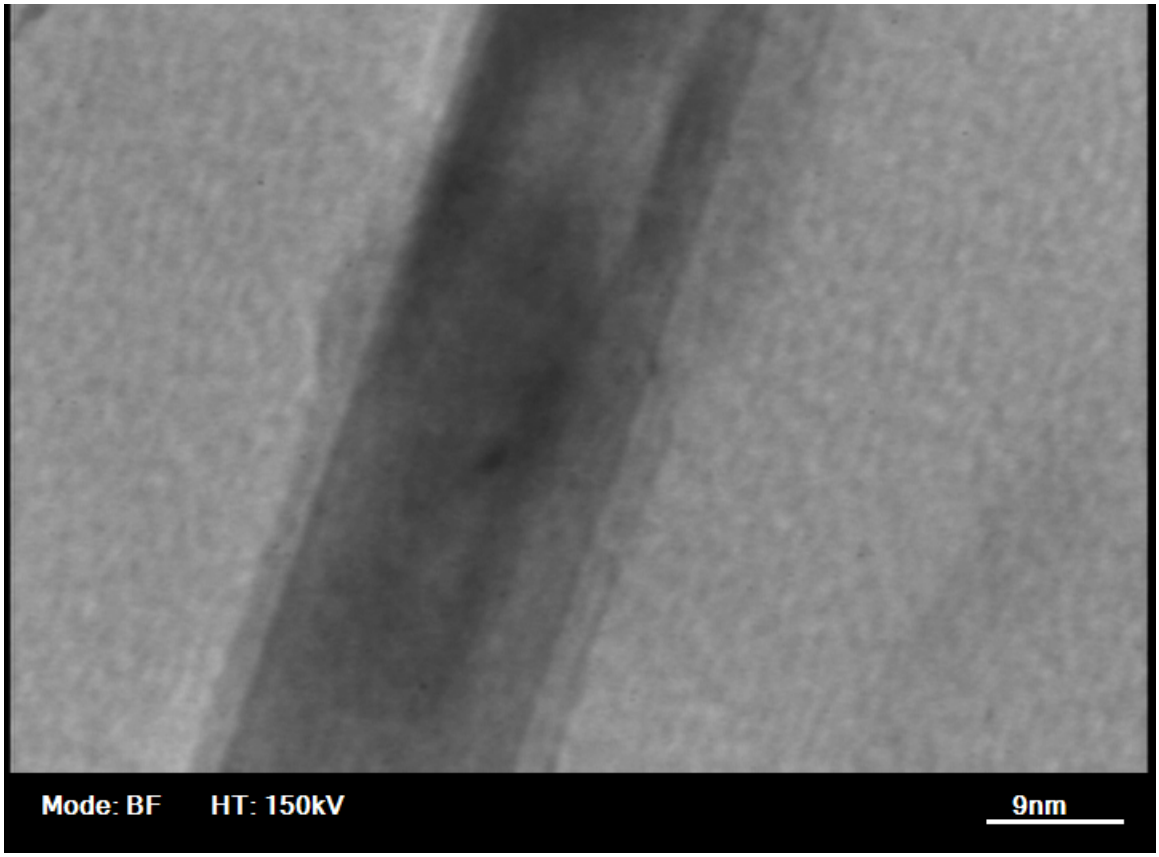

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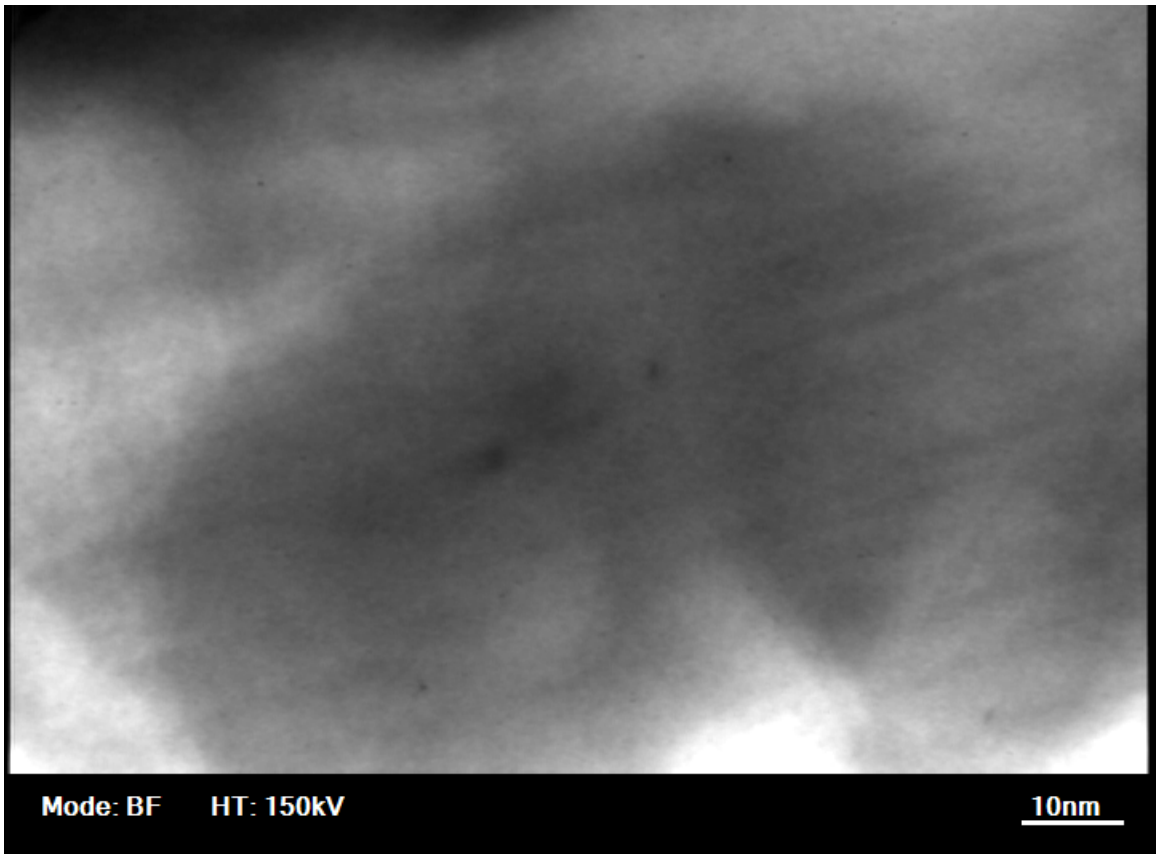

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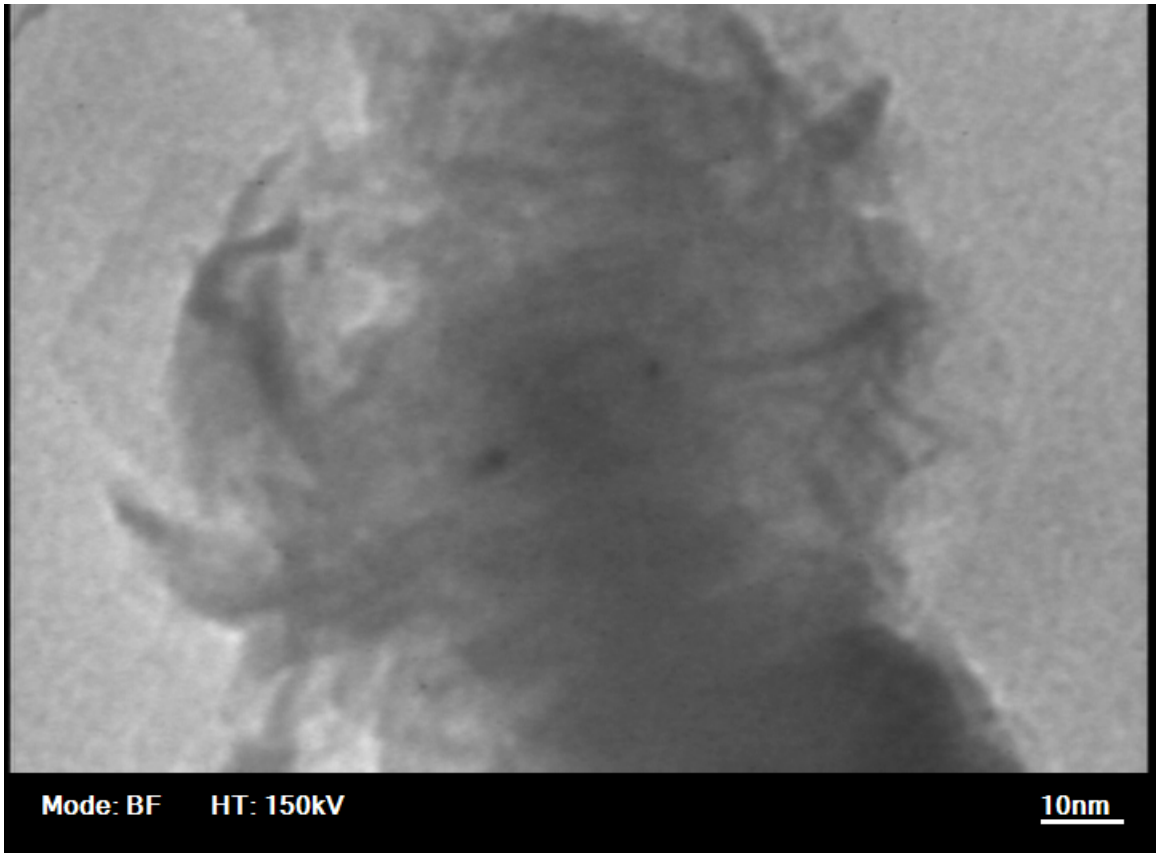

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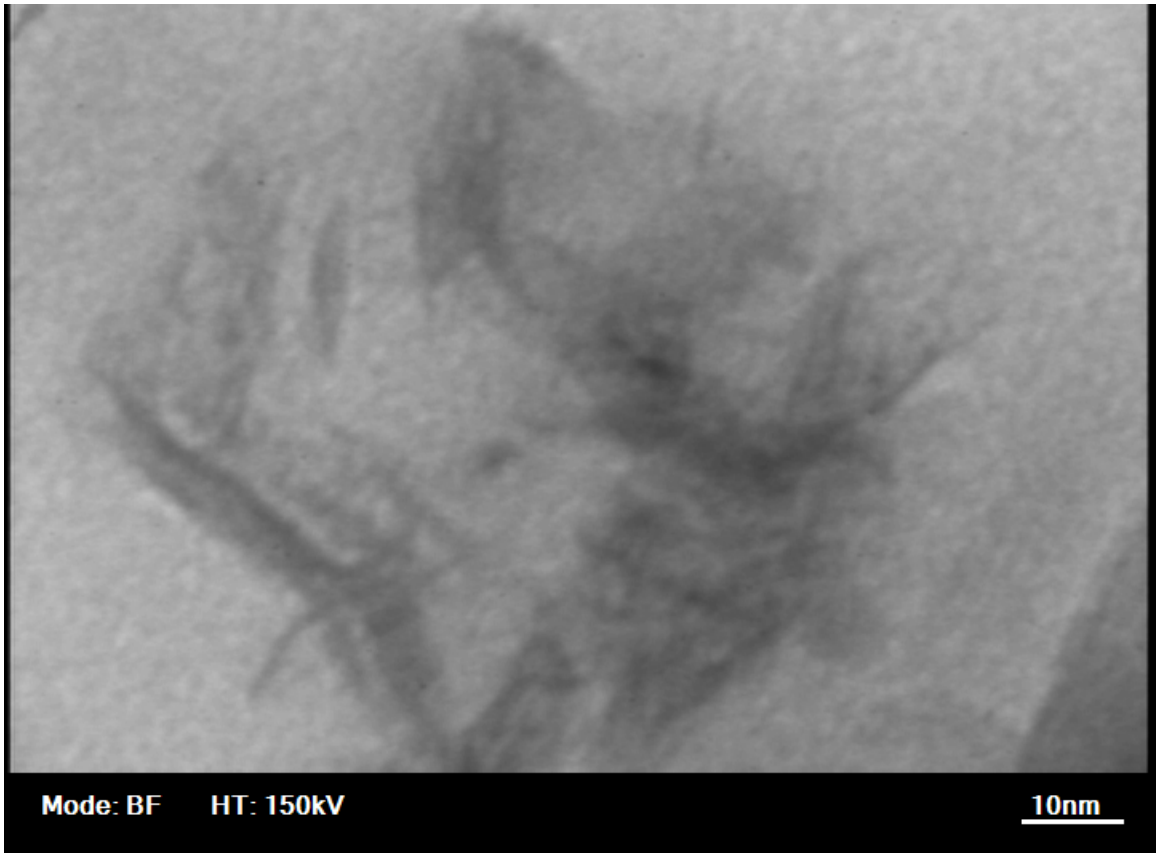

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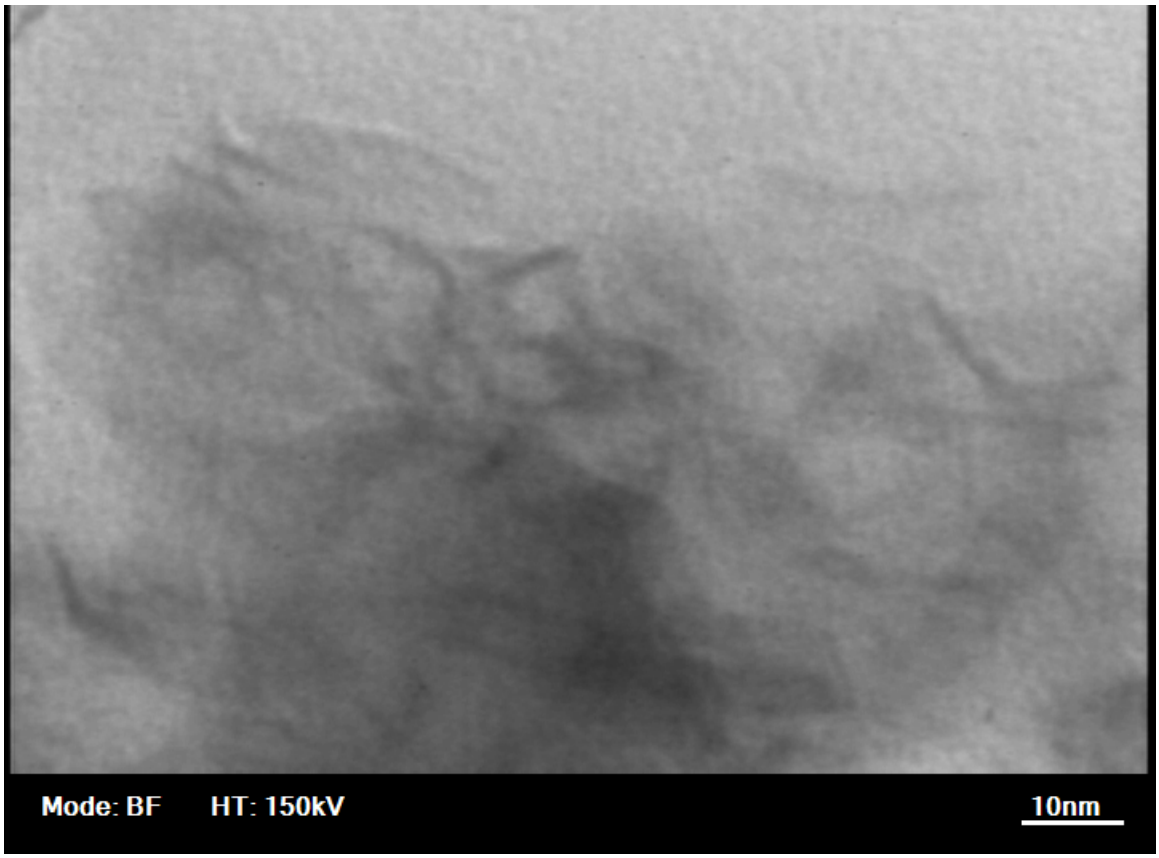
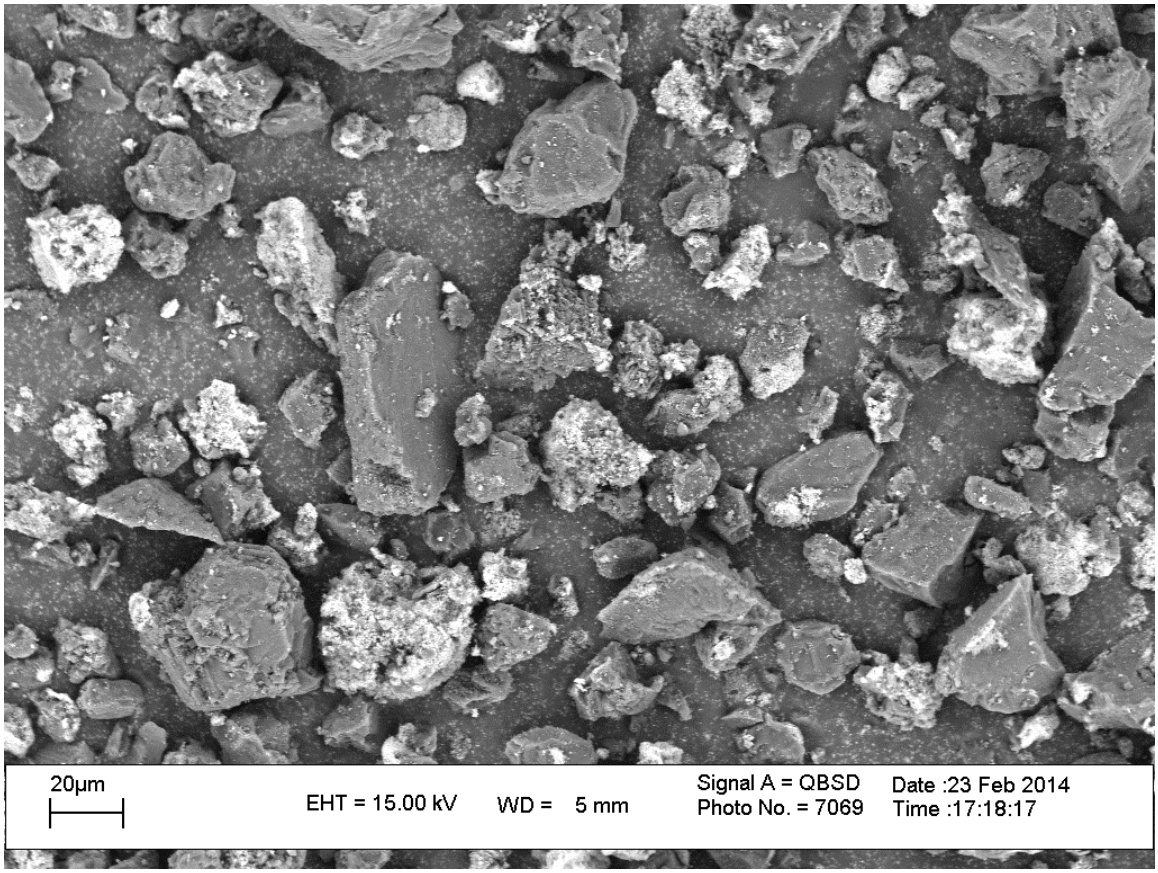


g

Fig. S2 TEM images from **1** (a-d) and **2** (e-g). other Mn oxides such as Mn_2O_3 and MnOOH are observed in **1**. Rod morphology (diameter: 20-40 nm) related to Mn_2O_3 and MnOOH are observed in TEM and HRTEM images of **1**. In **2**, only layered structure is observed.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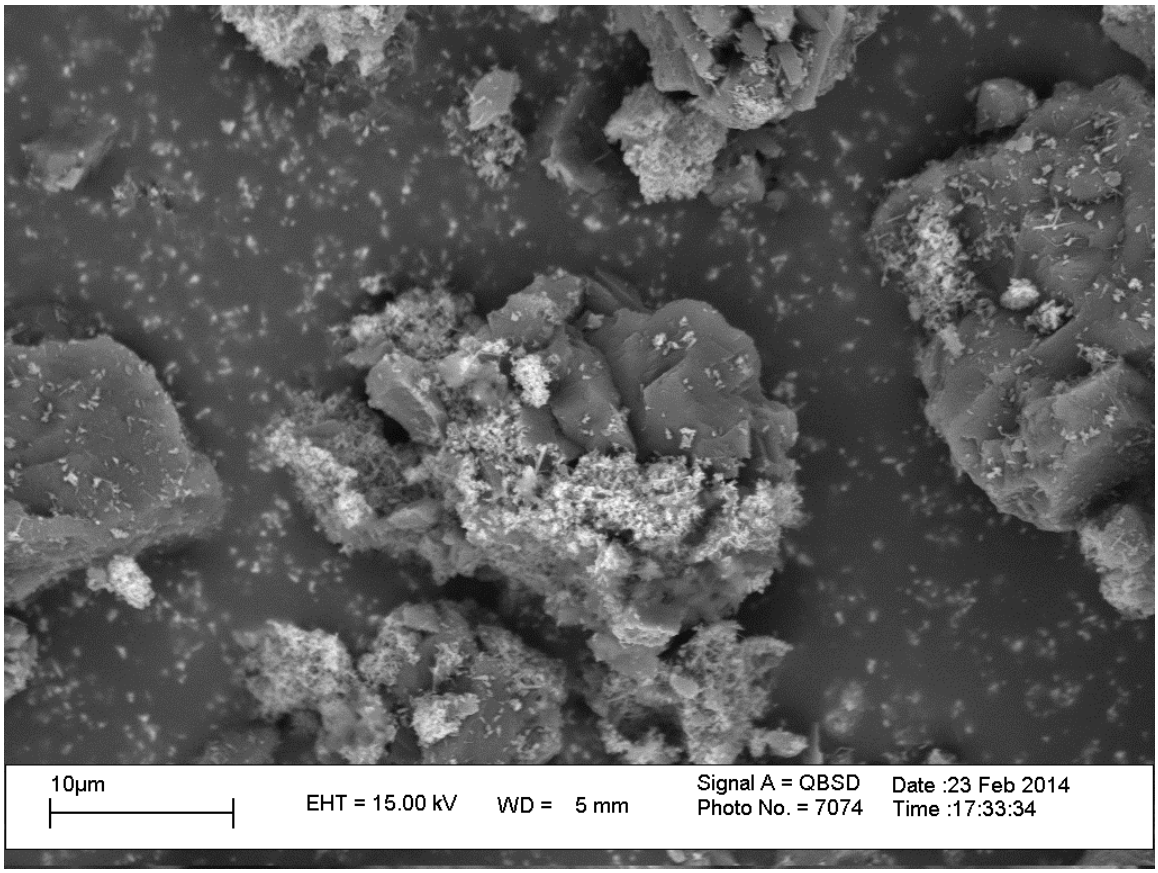
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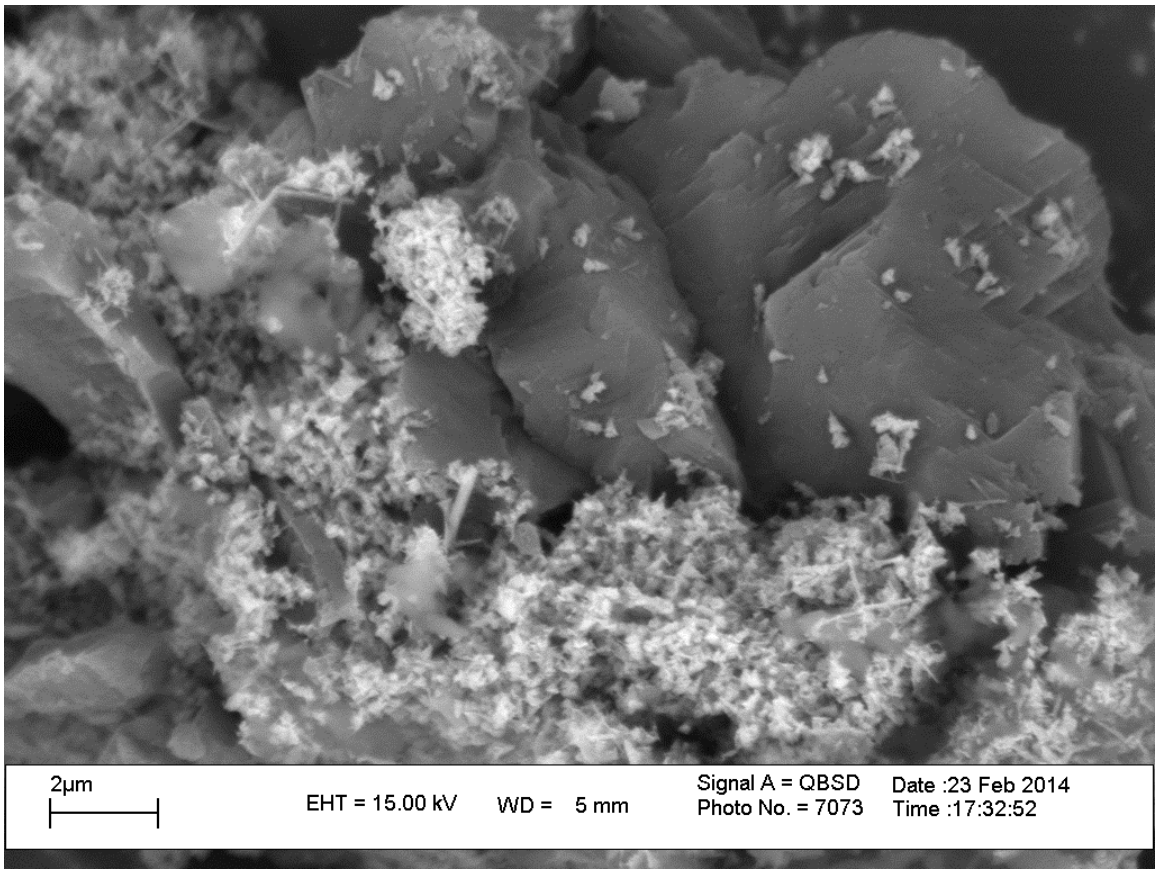
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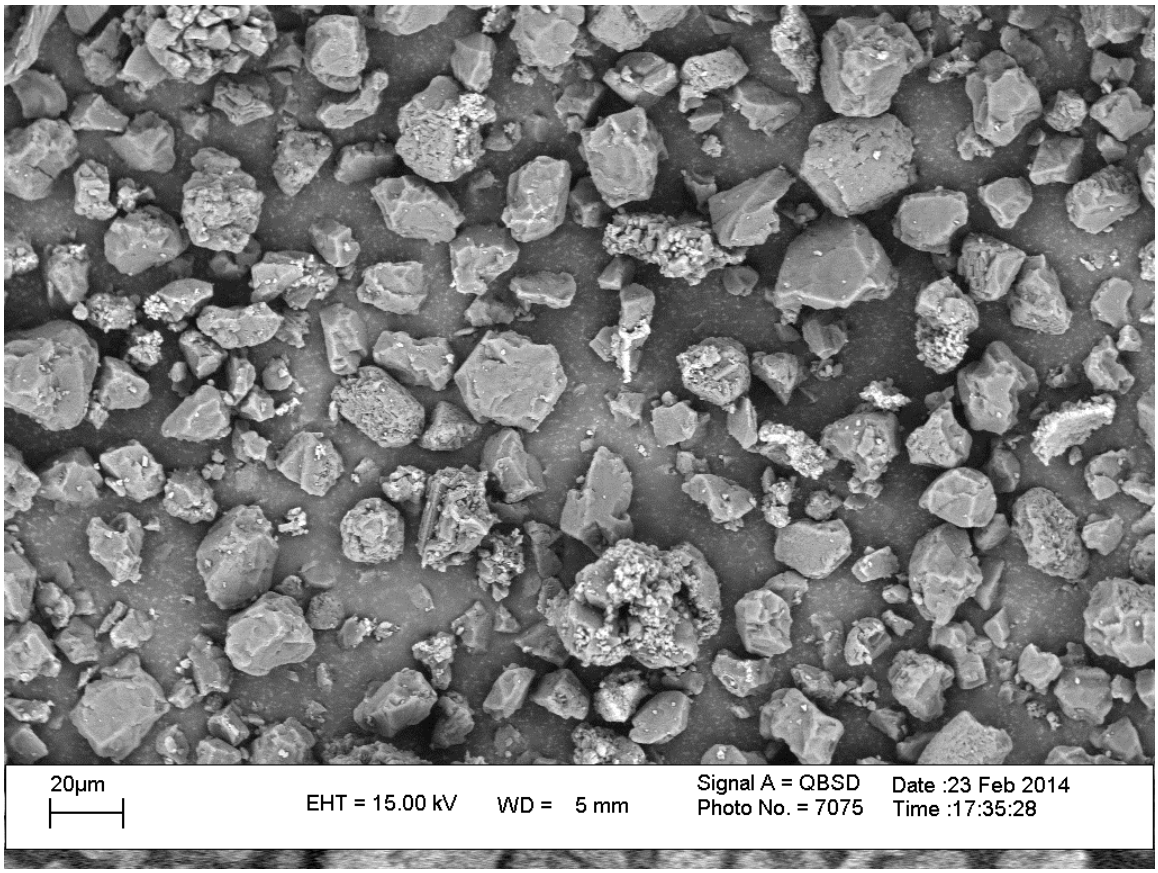
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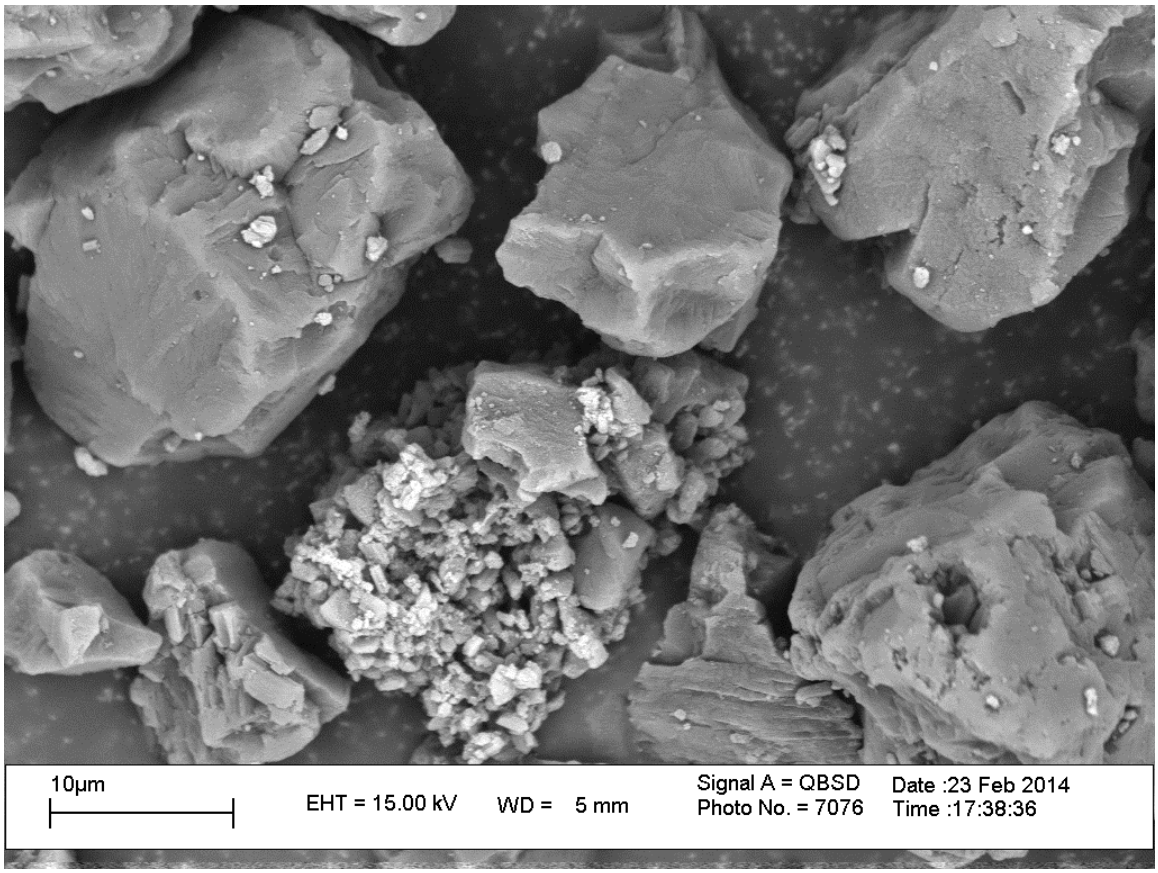
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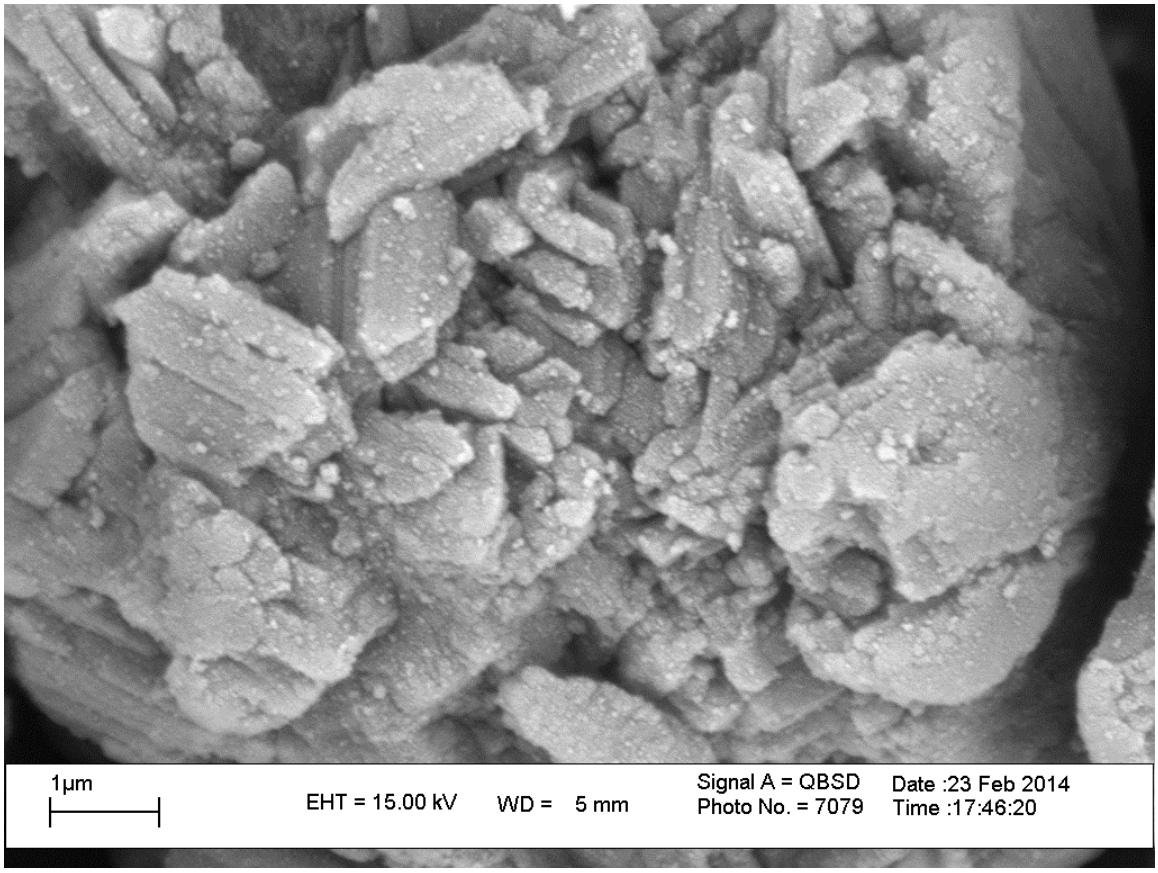
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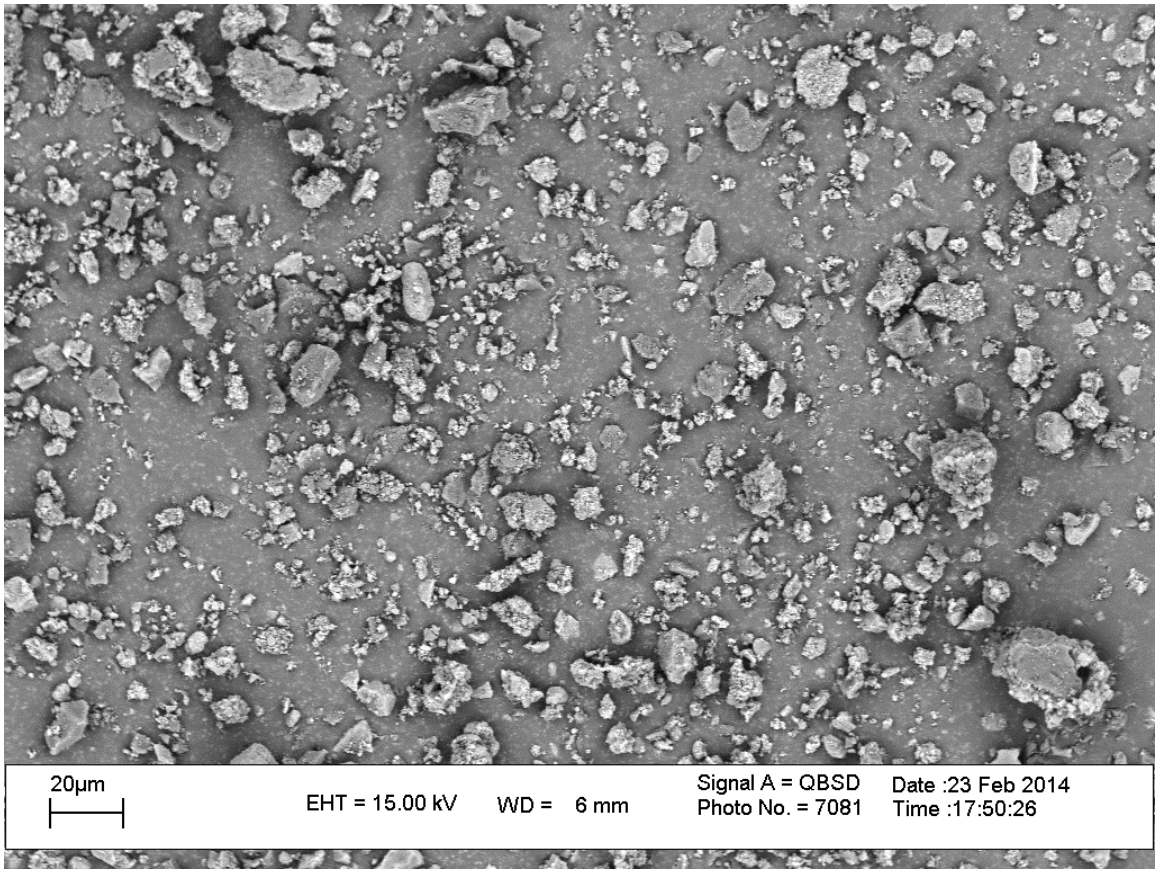
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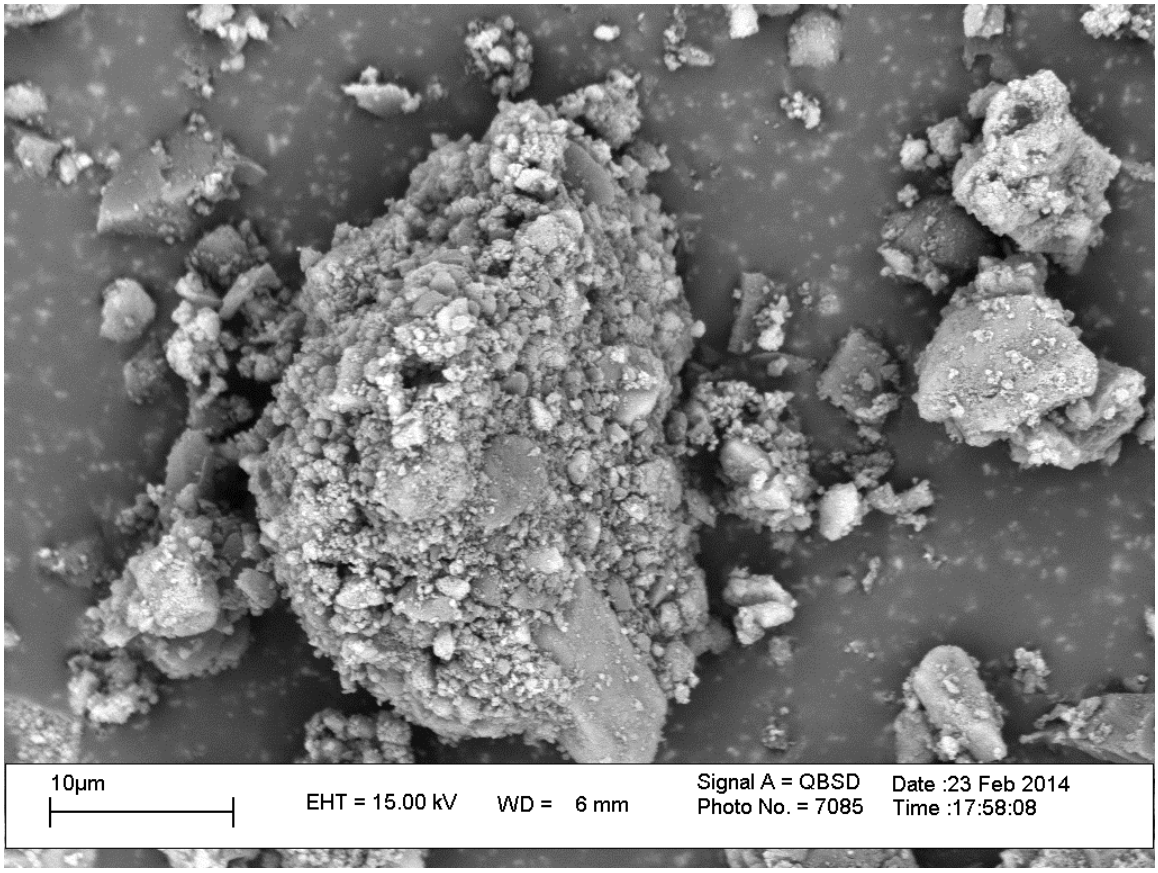
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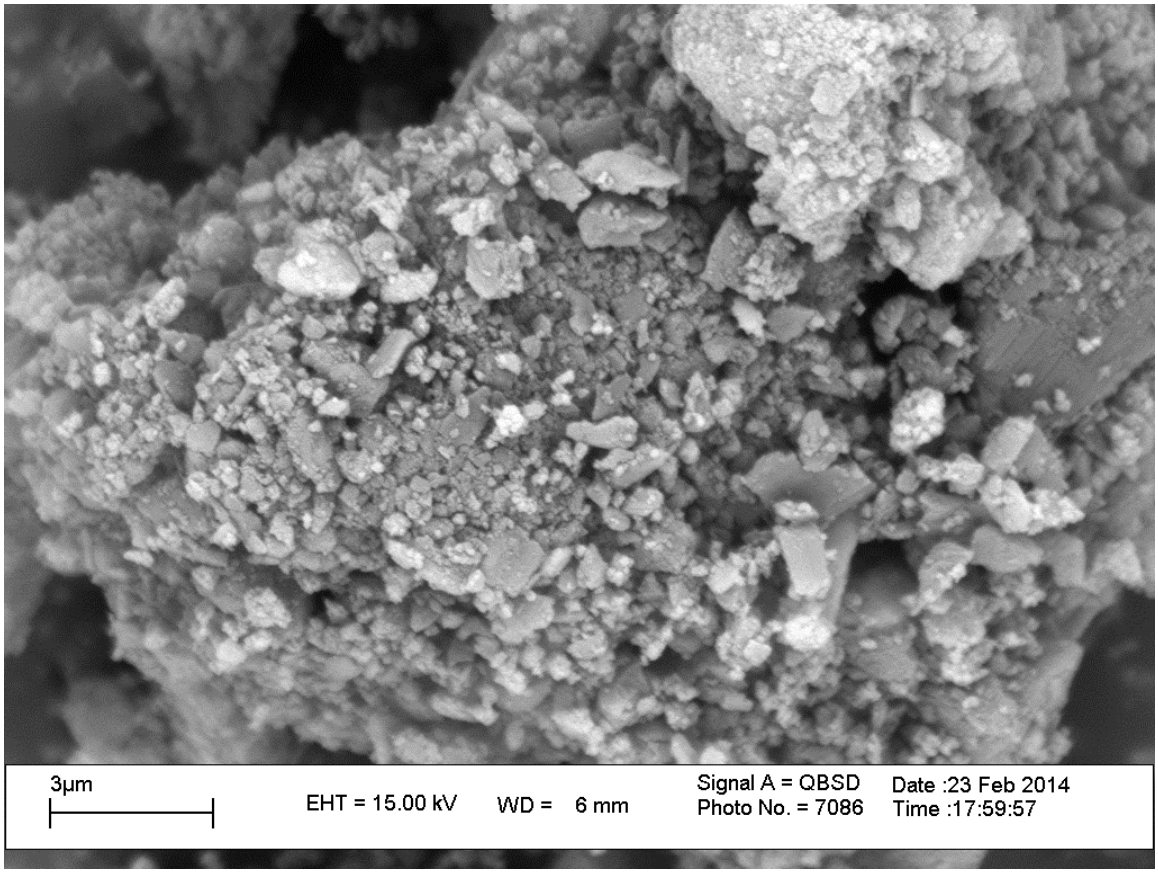
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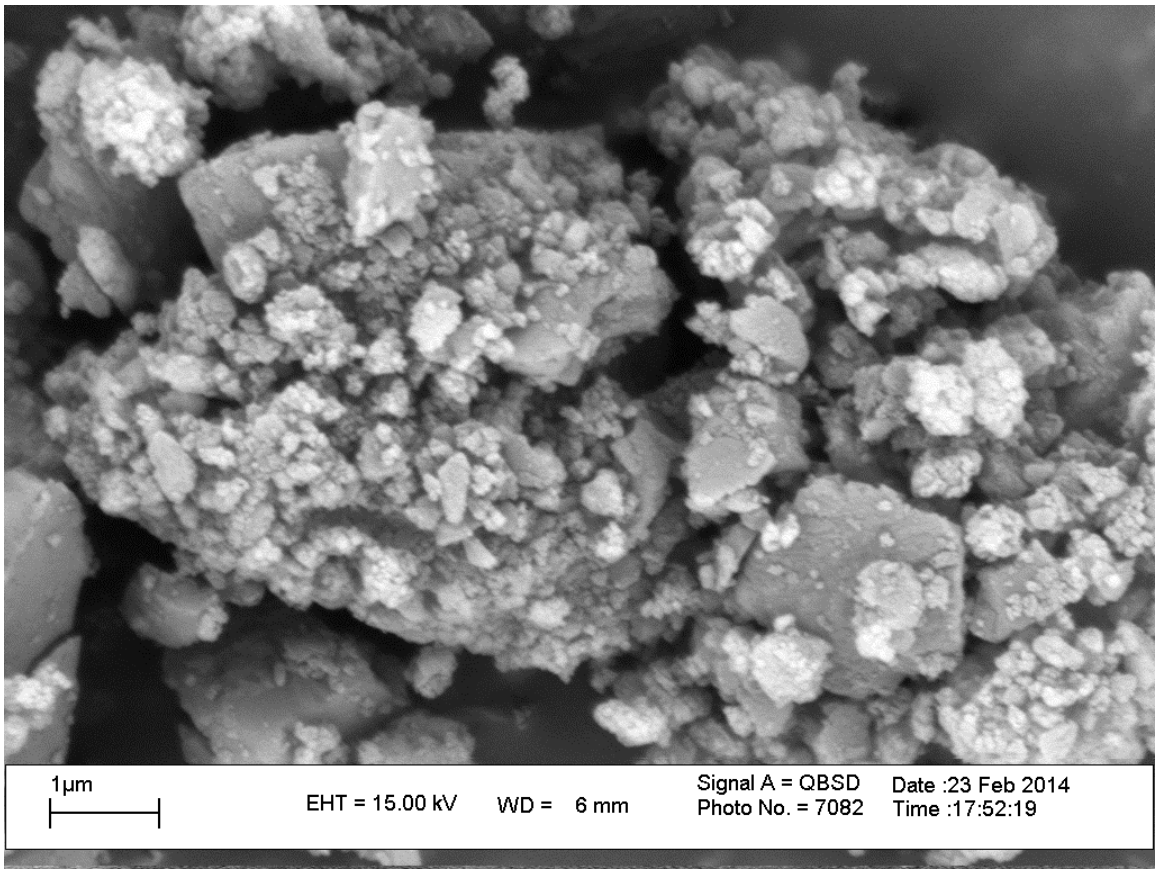
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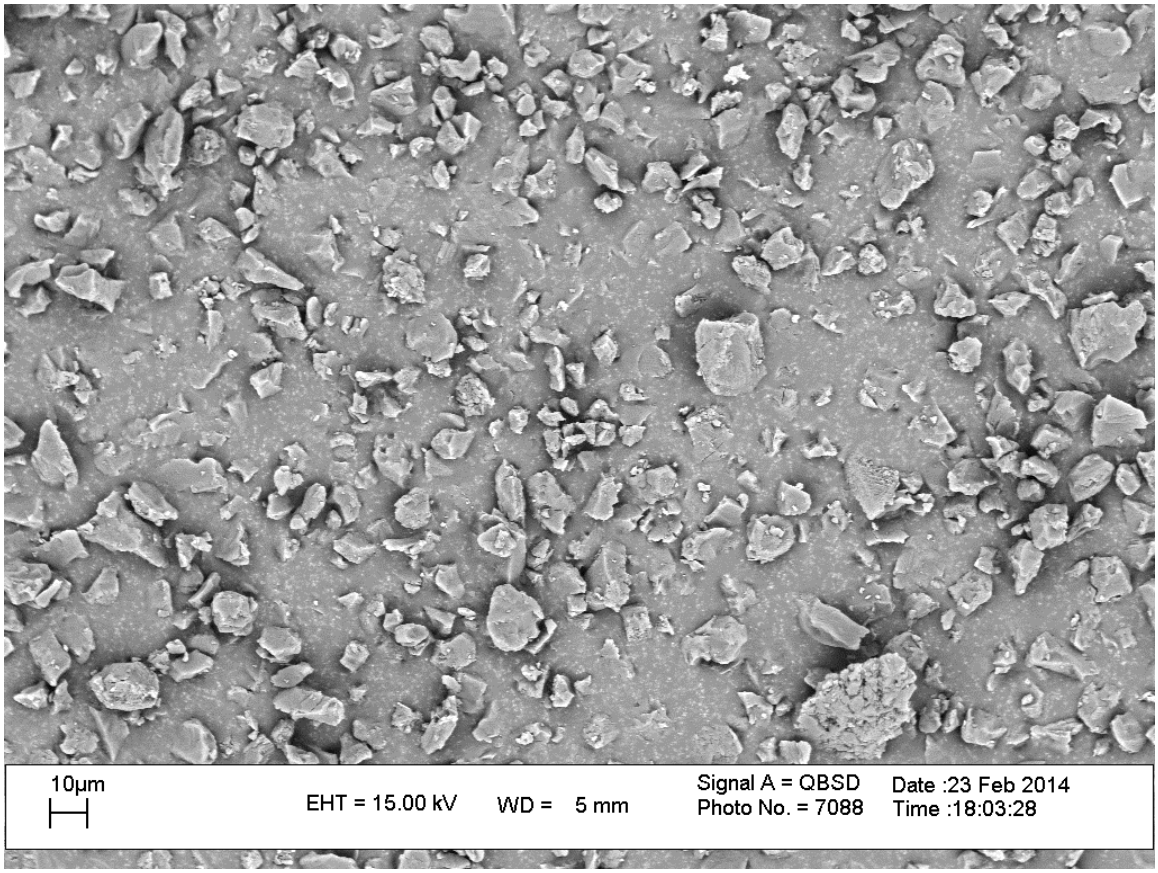
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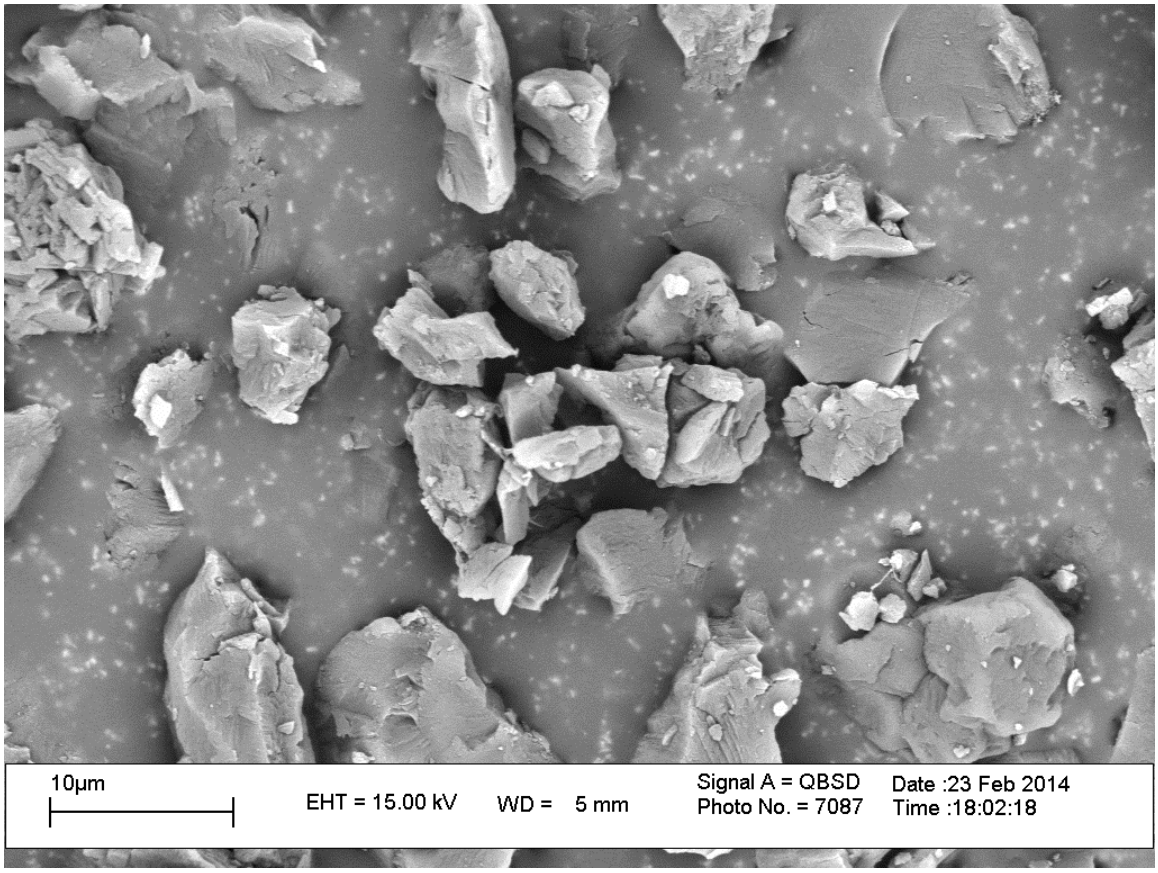
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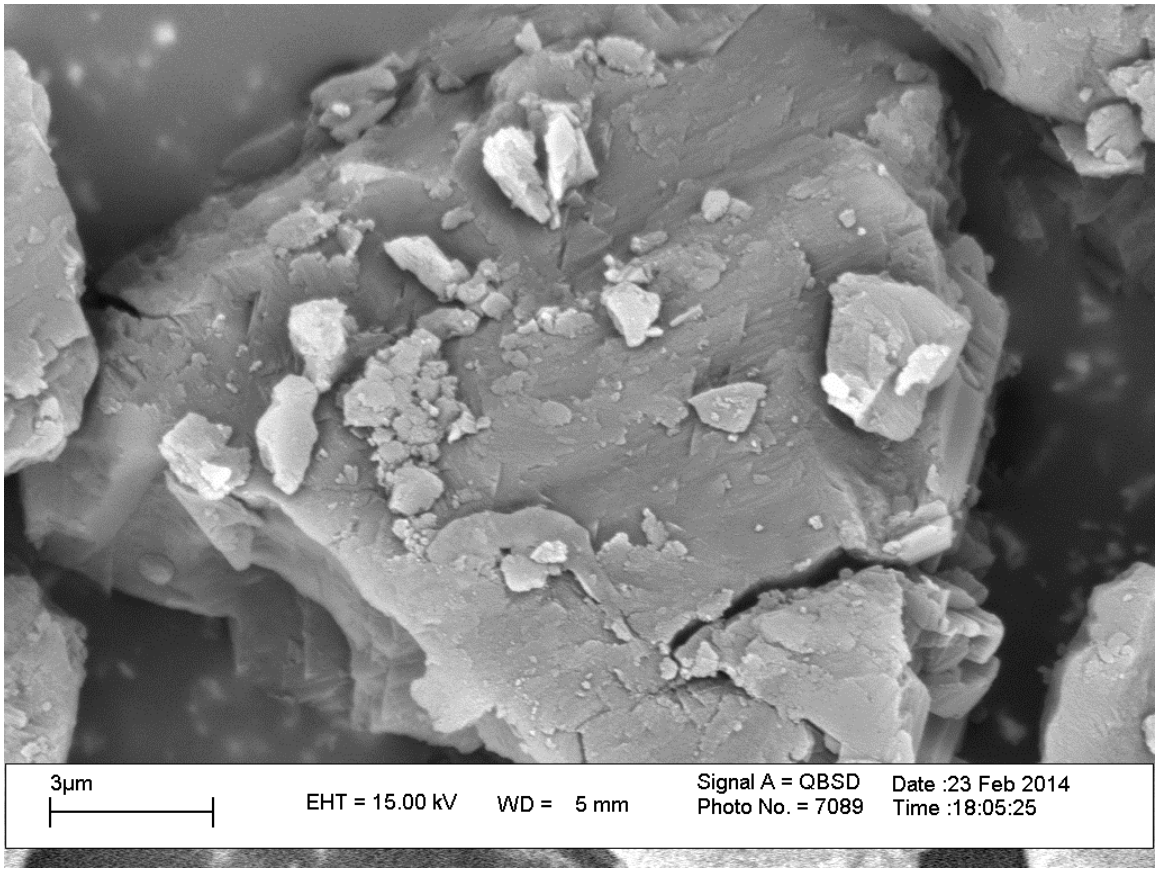
1



m

Fig. S3 SEM images of **1** (a-c), **2** (d-f), **3** (g-j) and **4** (k-m). In SEM images for **1**, rod morphology related to Mn_2O_3 and MnOOH (diameter 20-40 nm) is obseved. In **2**, small nano-structure Mn oxides (~ 20 nm) are observed that cover the surface of C_{60}. TEM and HRTEM images show that the nano-sized particles contain layers. In **3**, mixing Mn-Ca oxides (50-60 nm) and C_{60} are observed. In **4**, SEM images show no clear images from Mn oxide phase most probably because of very small particles prepared in the mild condition.

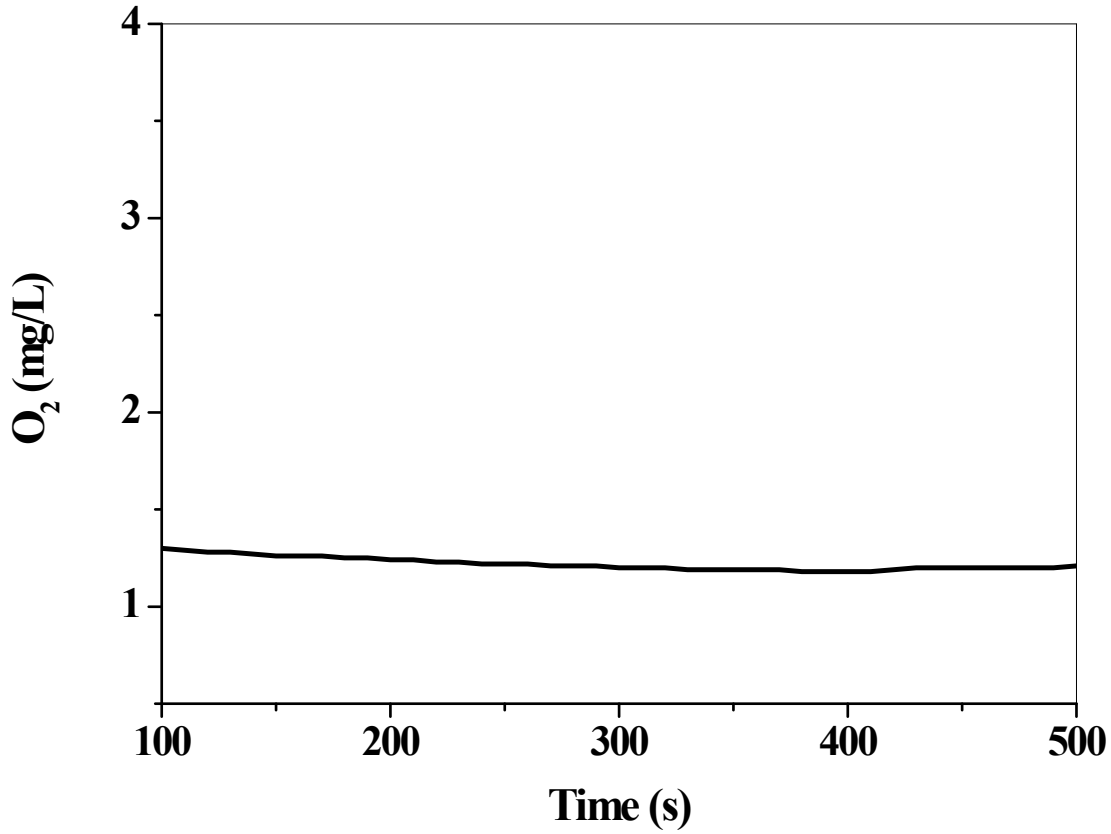


Fig. S4 The rate of oxygen evolution in the presence of only C_{60} (5 mg) ([Ce(IV)]: 0.22 M).