Electronic Supplementary Information (ESI)

An efficient and inexpensive water-oxidizing manganese-based oxide electrode

Mohammad Mahdi Najafpour*[ab] and Seyedeh Maedeh Hosseini[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;

Contents

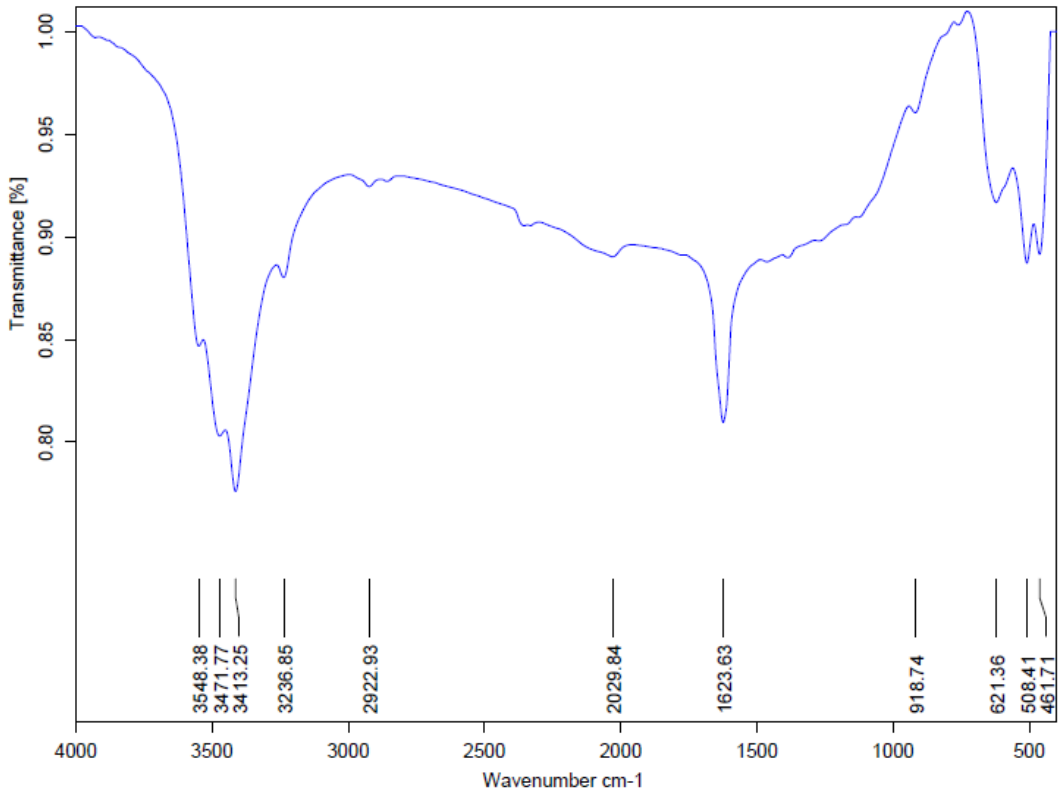


Fig. S1 The FTIR spectrum of the powder from Mn oxide on the surface of A500.

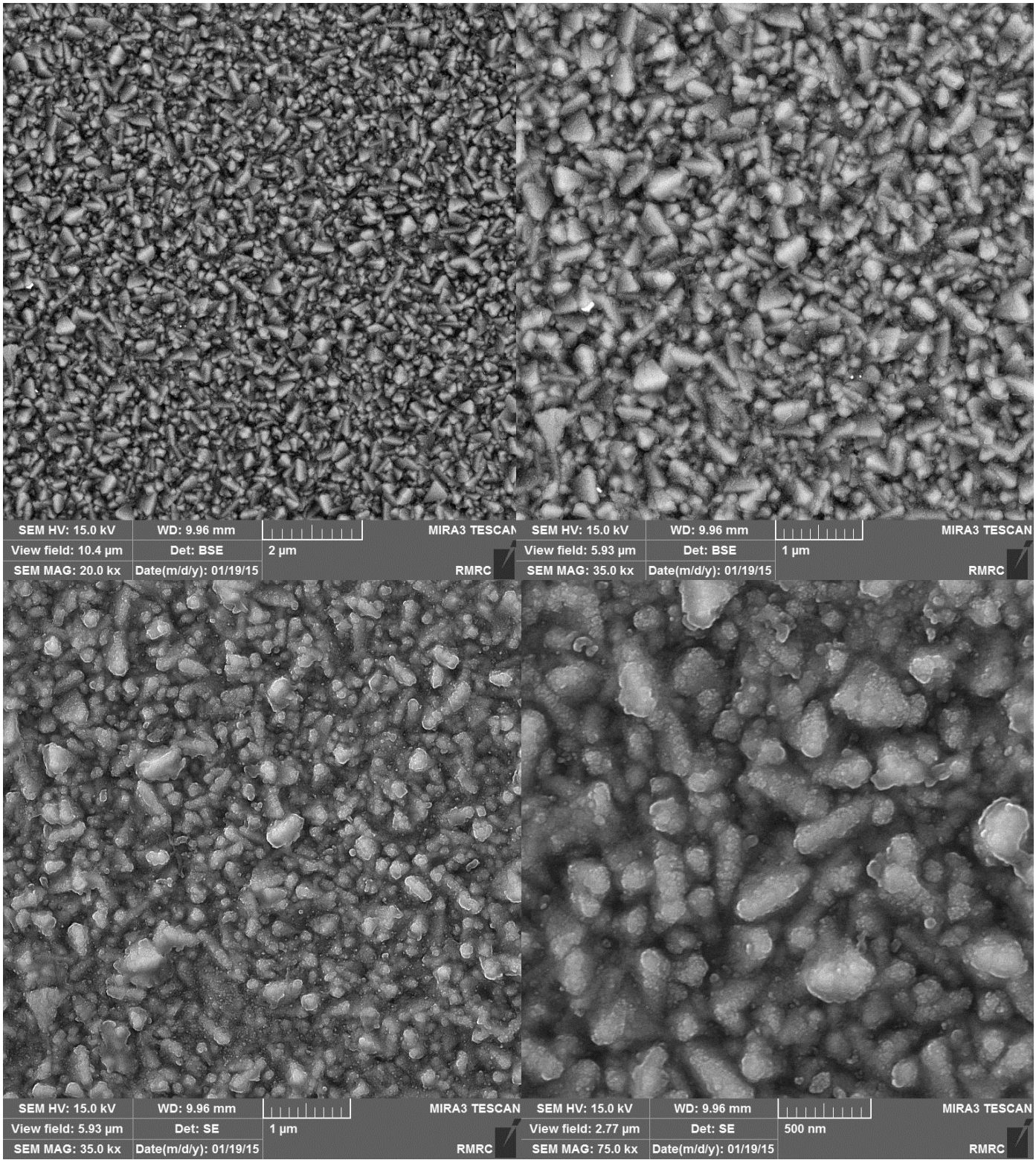


Fig. S2 SEM images from uncoated FTO.

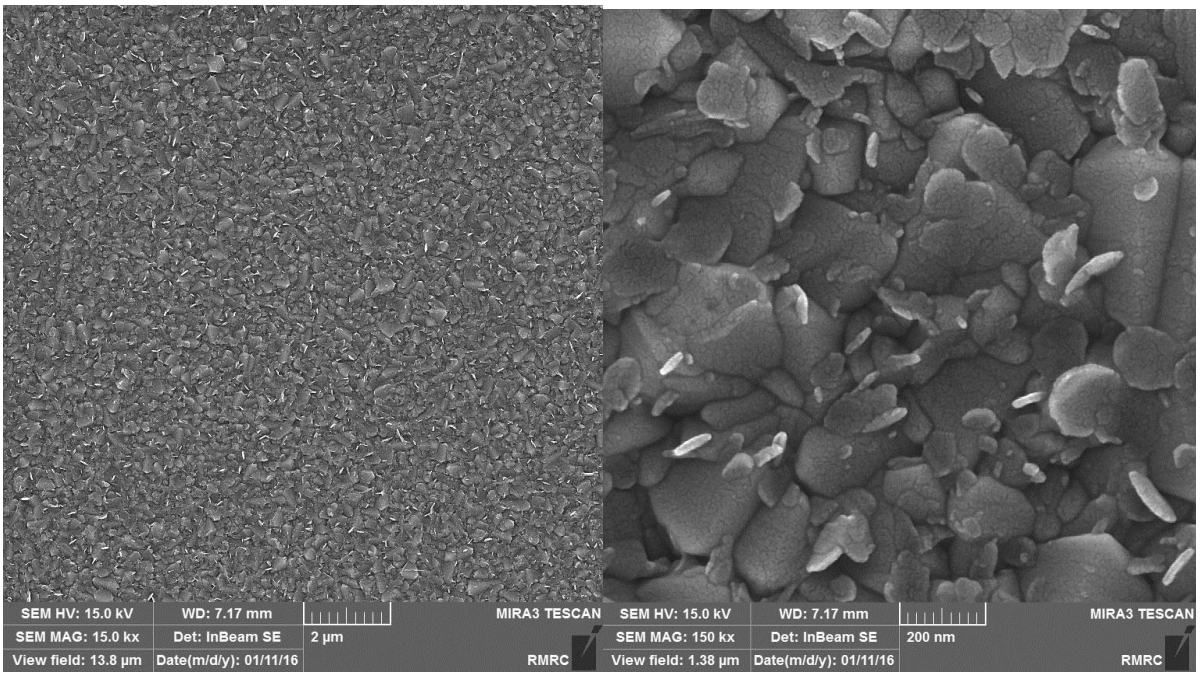


Fig. S3 SEM images from A0.5.

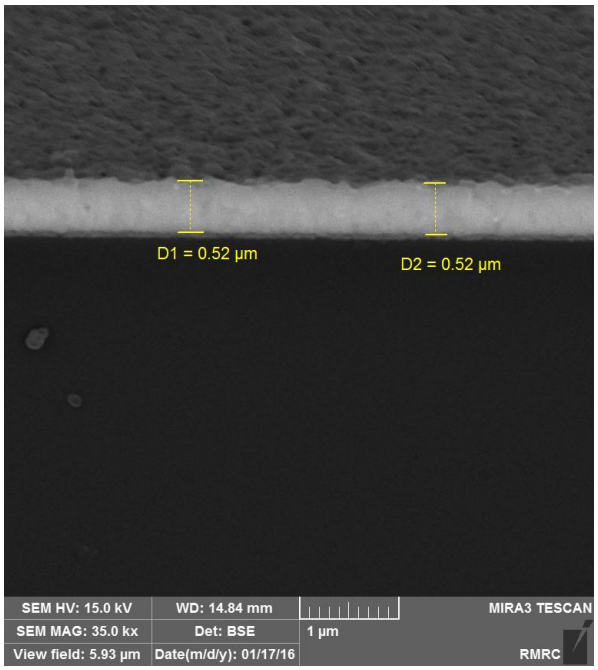


Fig. S4 Cross-section of A0.5.

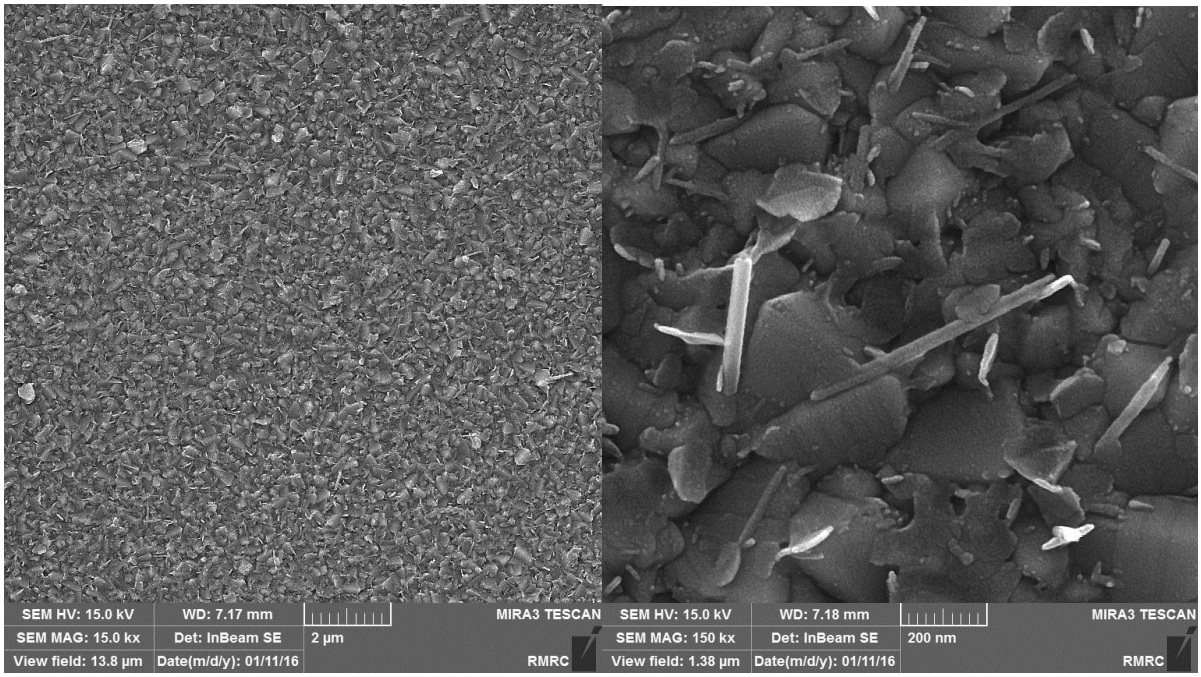


Fig. S5 SEM images from A1.

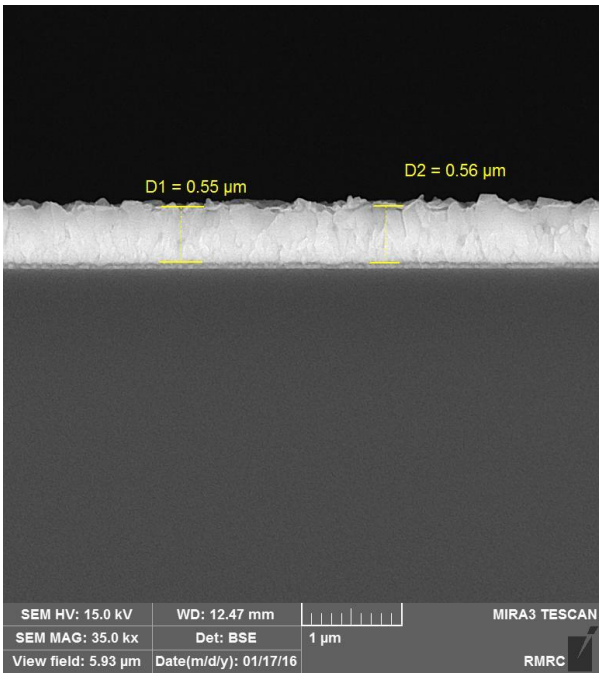


Fig. S6 Cross-section of A1.

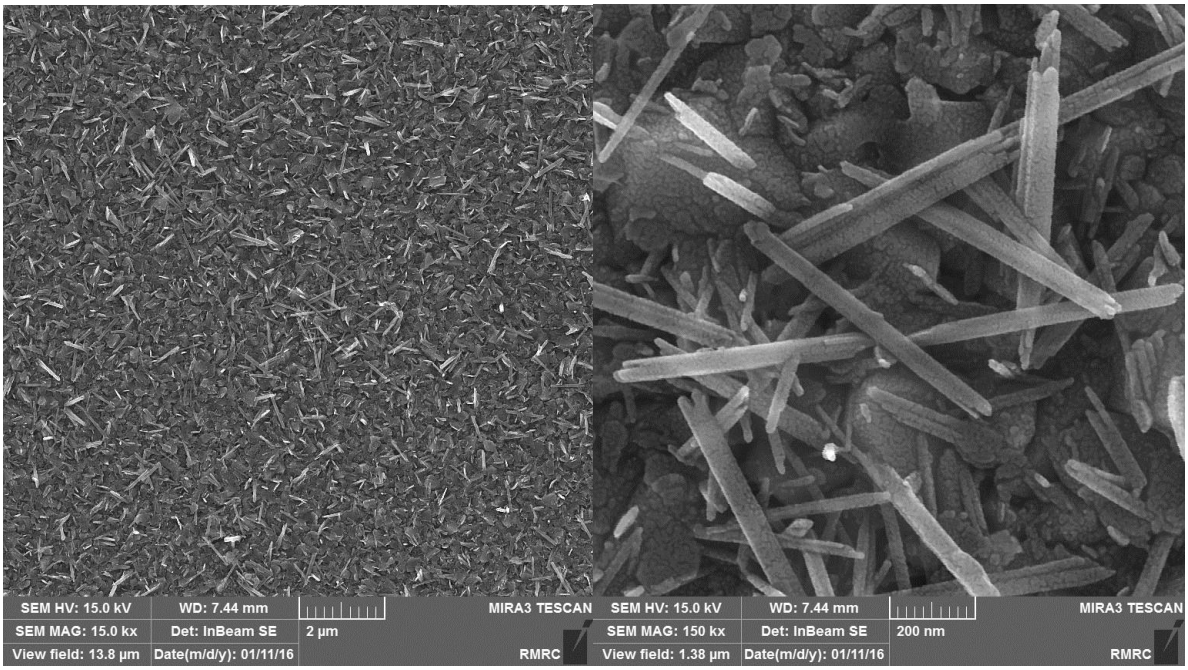


Fig. S7 SEM images from A2.

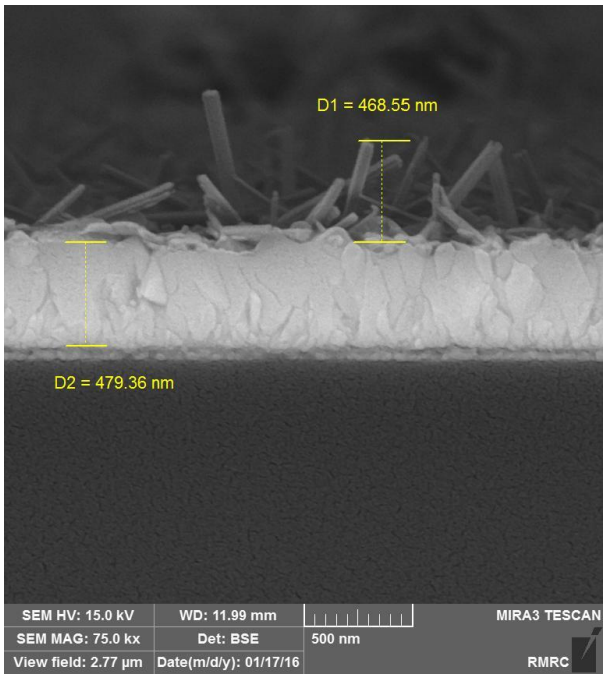


Fig. S8 Cross-section of A2.

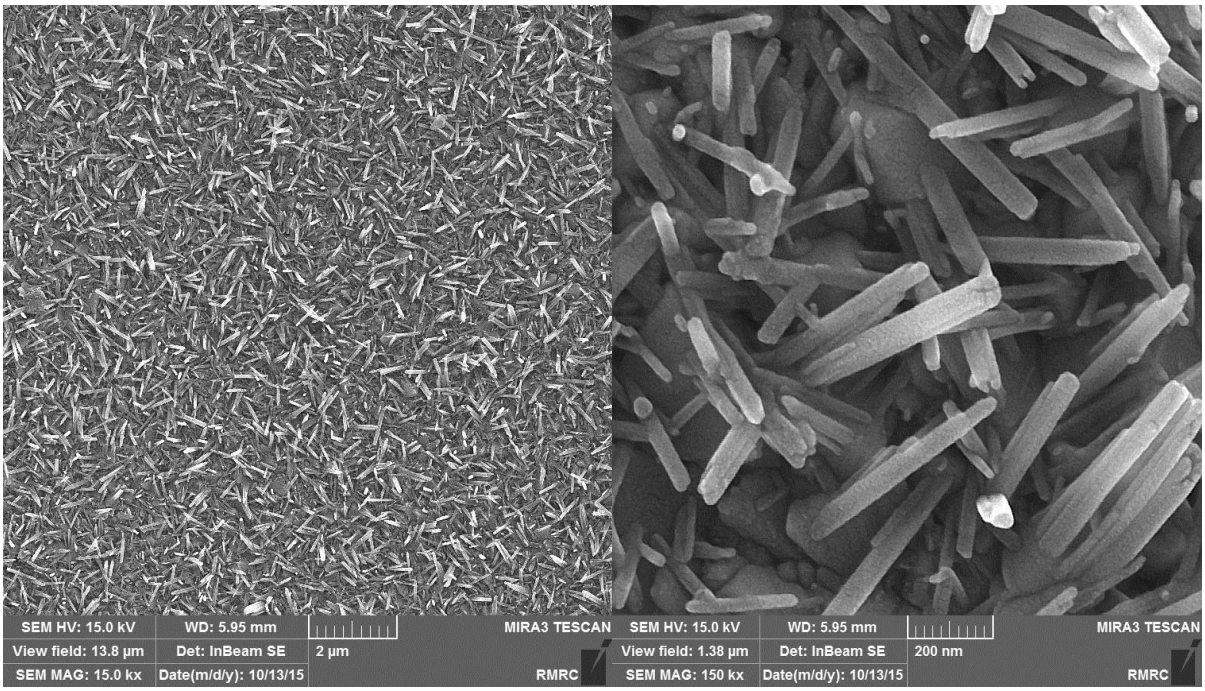


Fig. S9 SEM images from A5.

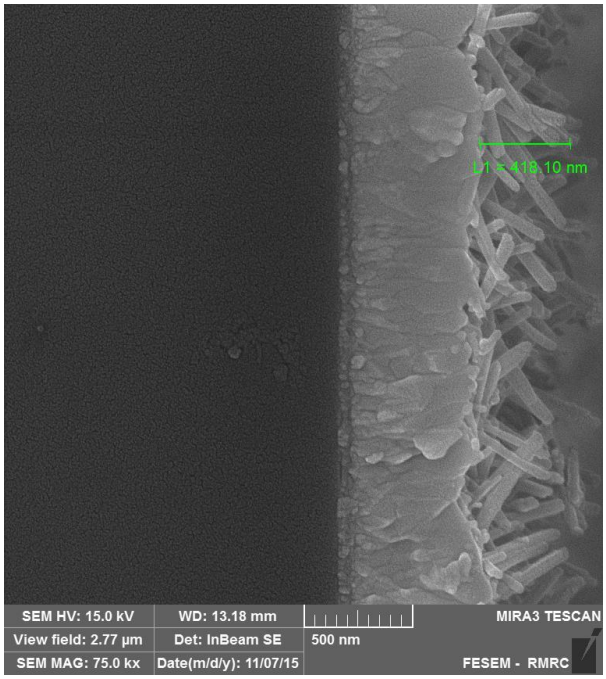


Fig. S10 Cross-section of A5.

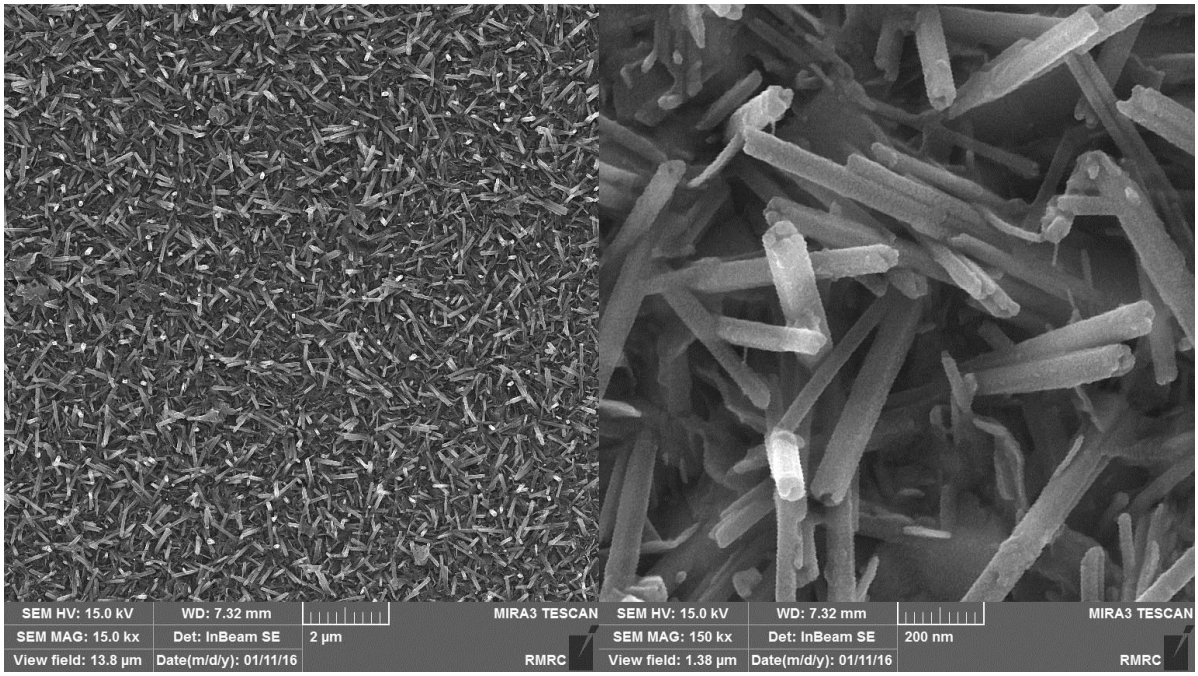


Fig. S11 SEM images from A5 after one week in at a constant potential of +1.9 V in KOH solution (0.1 M).

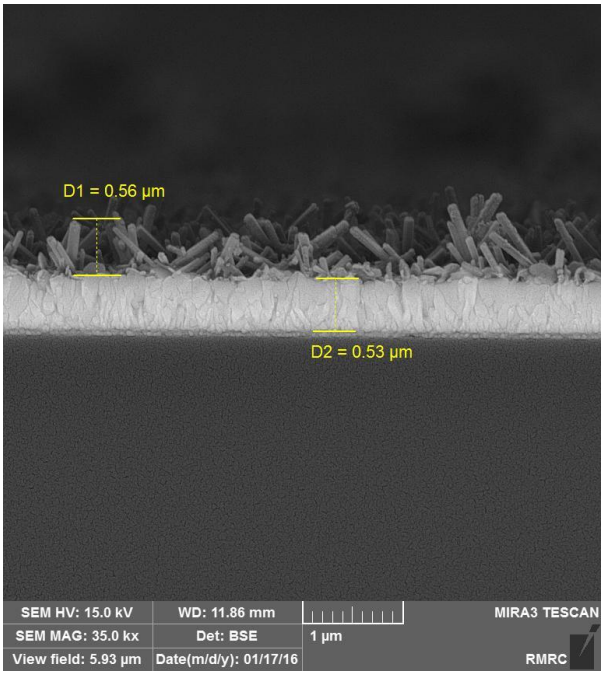


Fig. S12 Cross-section of A5 after one week in at a constant potential of +1.9 V in KOH solution (0.1 M).

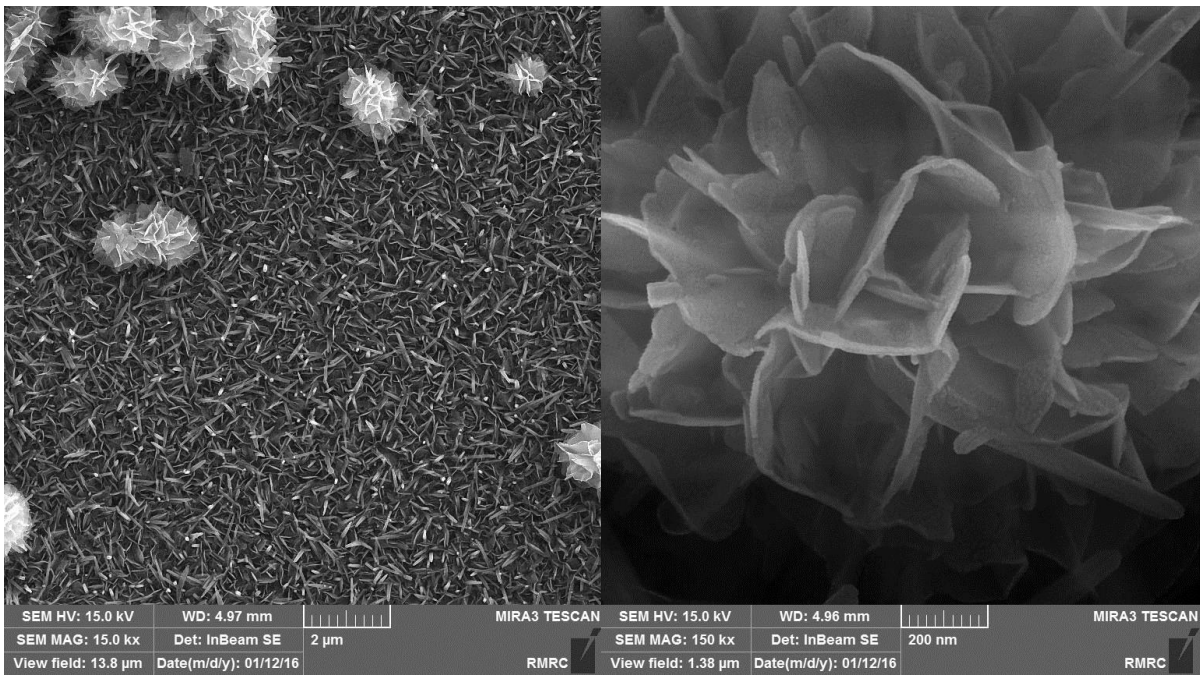


Fig. S13 SEM images from A10.

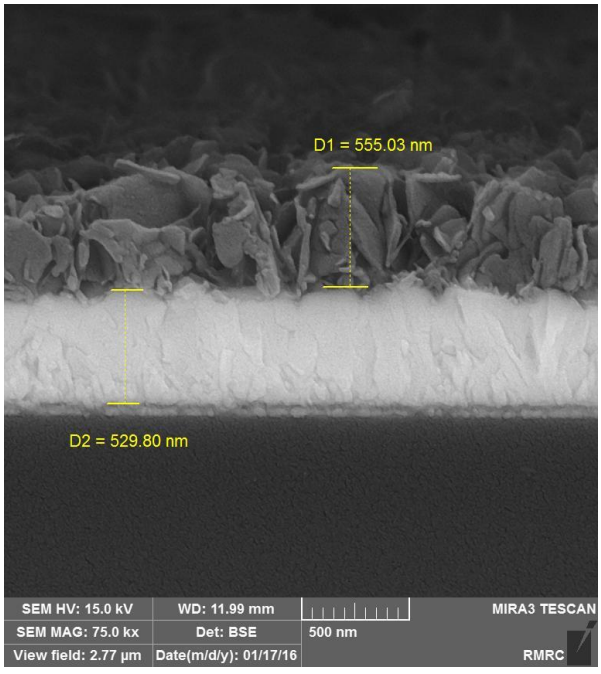


Fig. S14 Cross-section of A10.

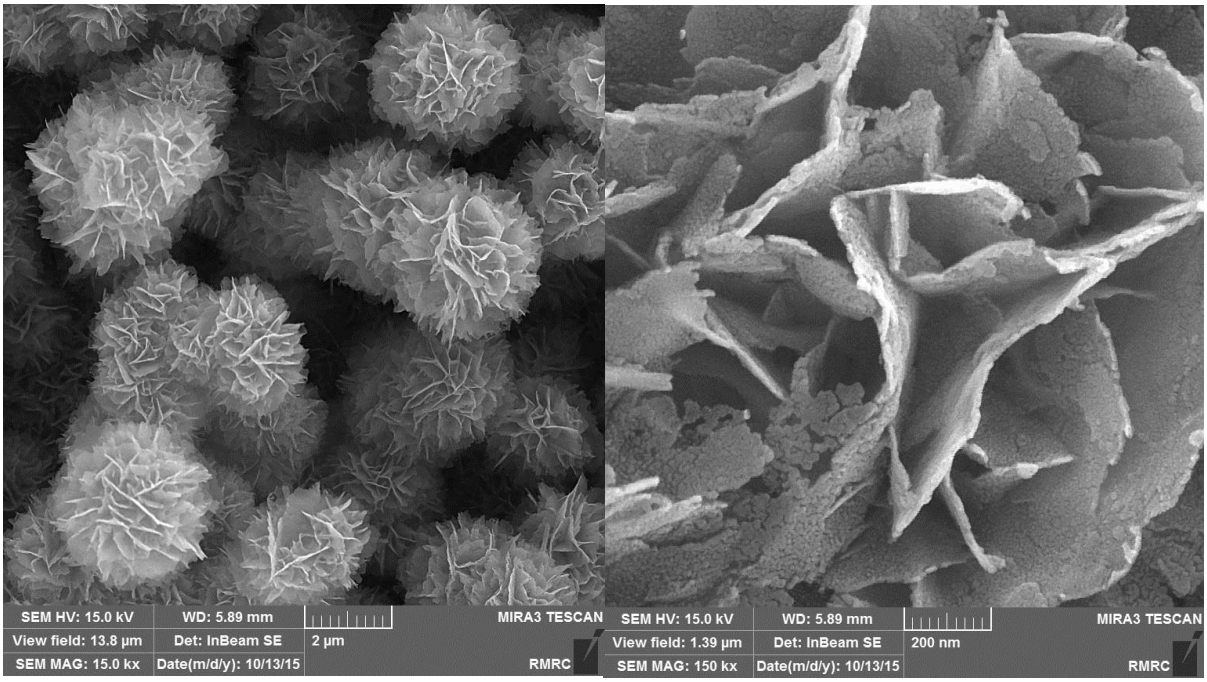


Fig. S15 SEM images from A100.

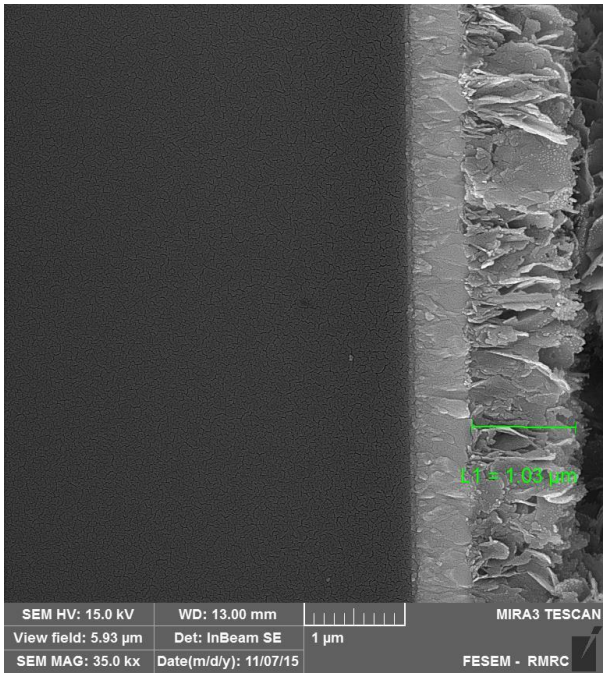


Fig. S16 Cross-section of A100.

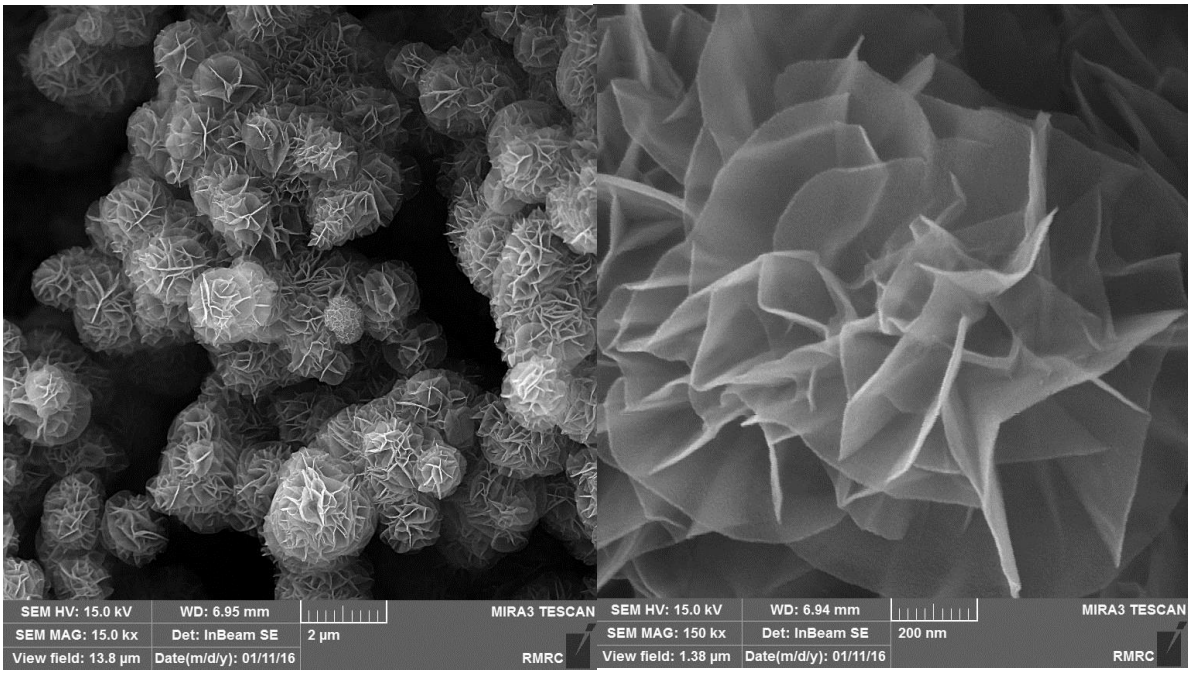


Fig. S17 SEM images from A500.

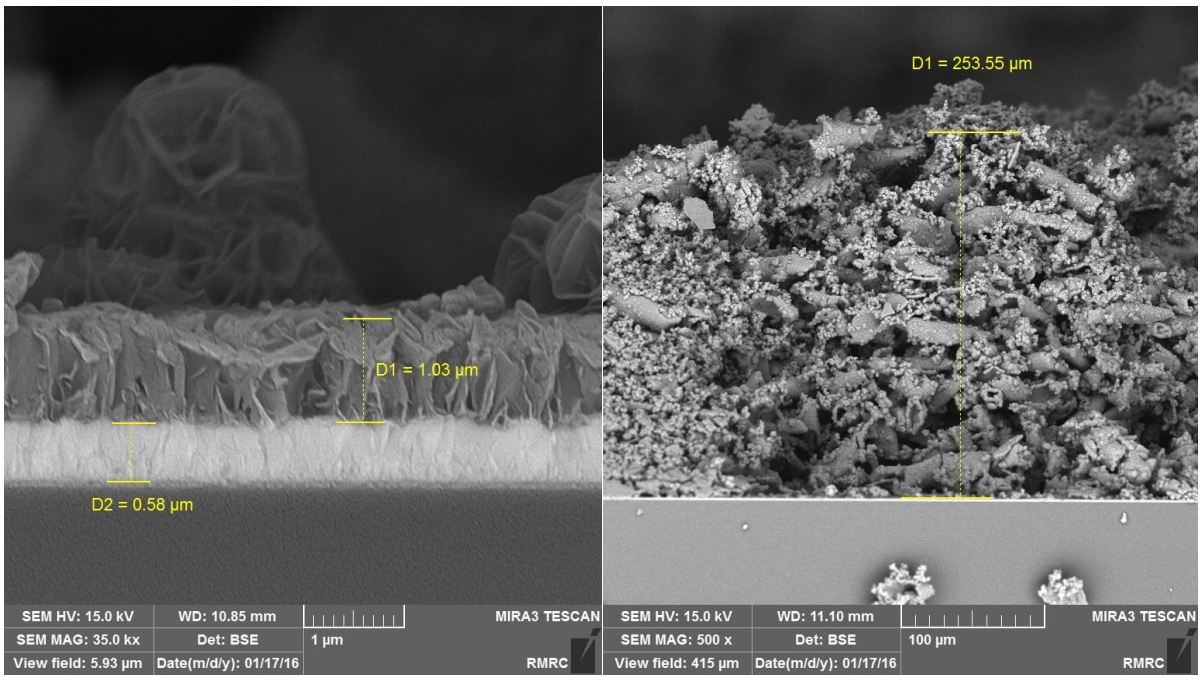


Fig. S18 Cross-section of A500.

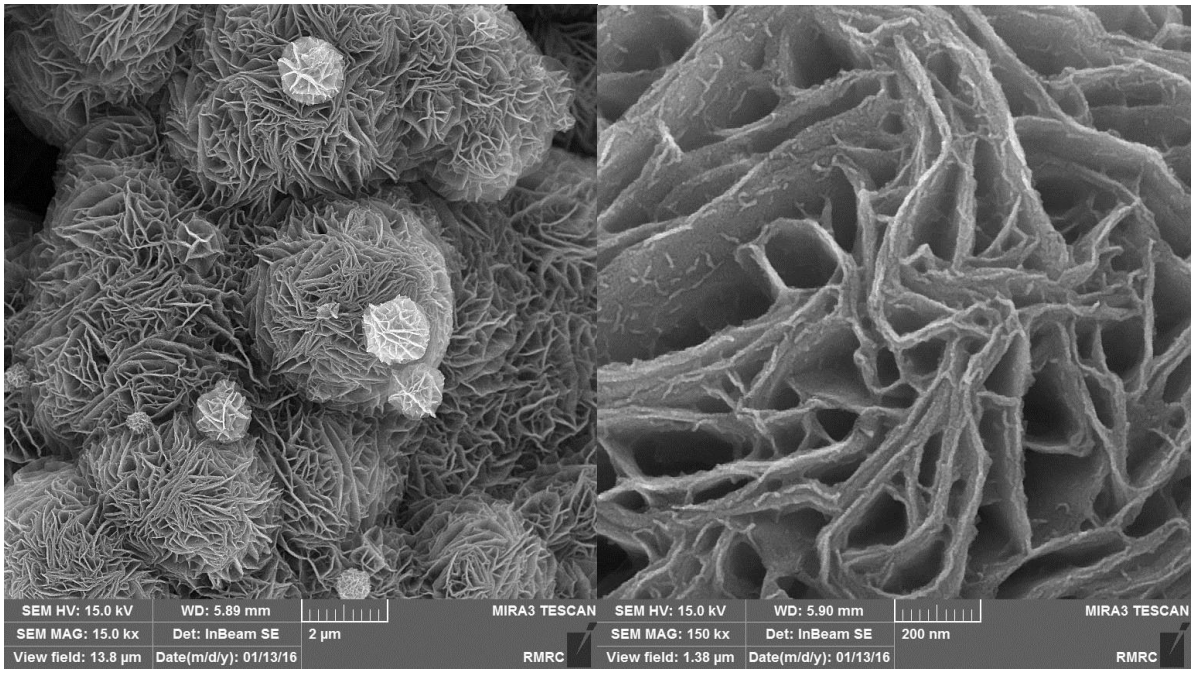


Fig. S19 SEM images from A1000.

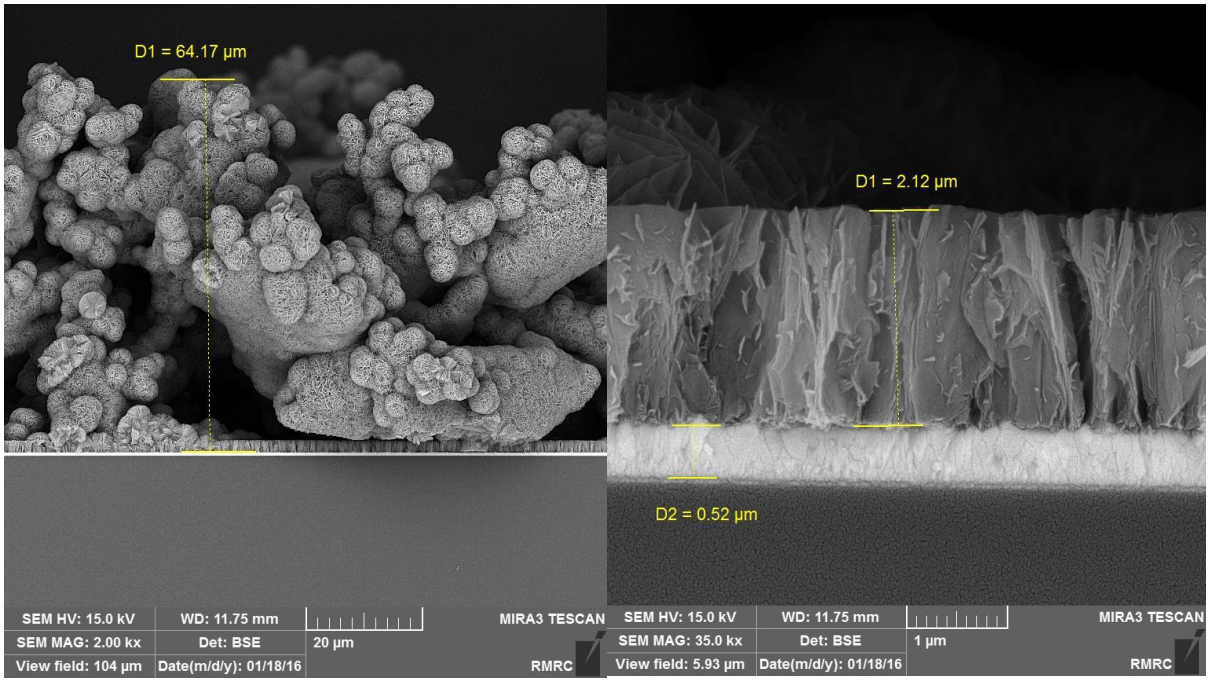


Fig. S20 Cross-sections of A1000.

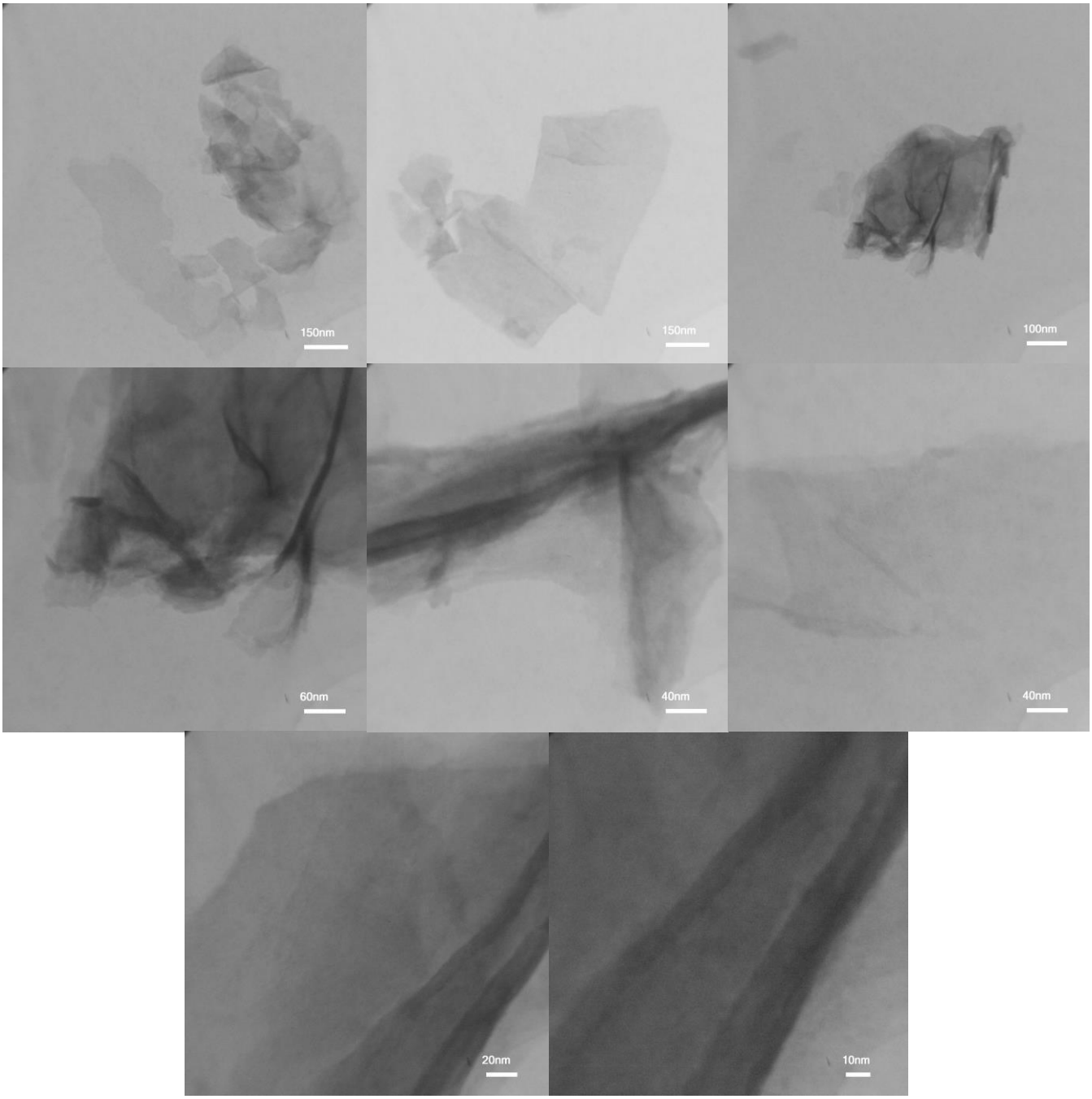


Fig. S21 TEM images of the powder from Mn oxide on the surface of FTO (A100).

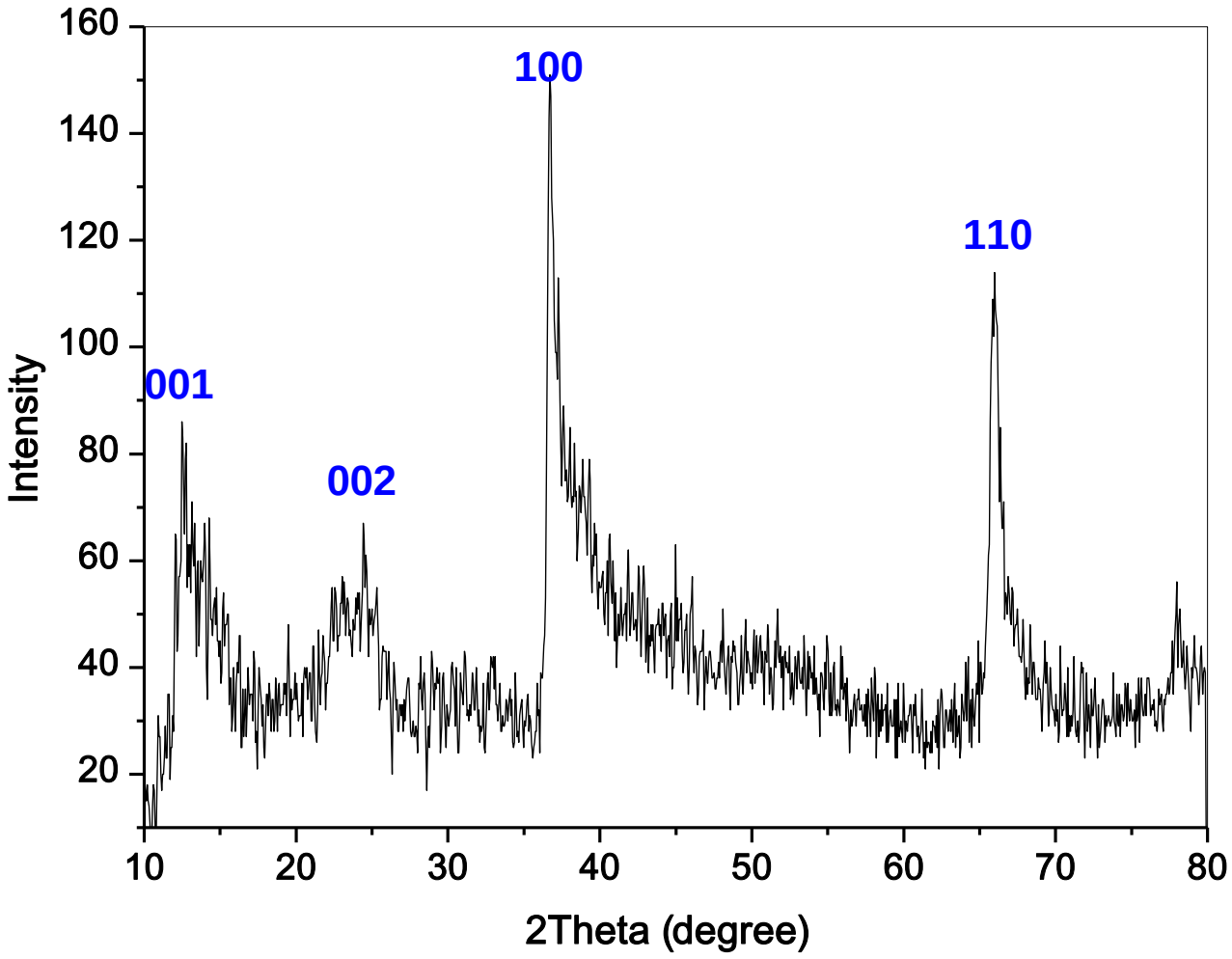


Fig. S22 XRD patterns from A500. The blue numbers show the related peaks in birnessite.

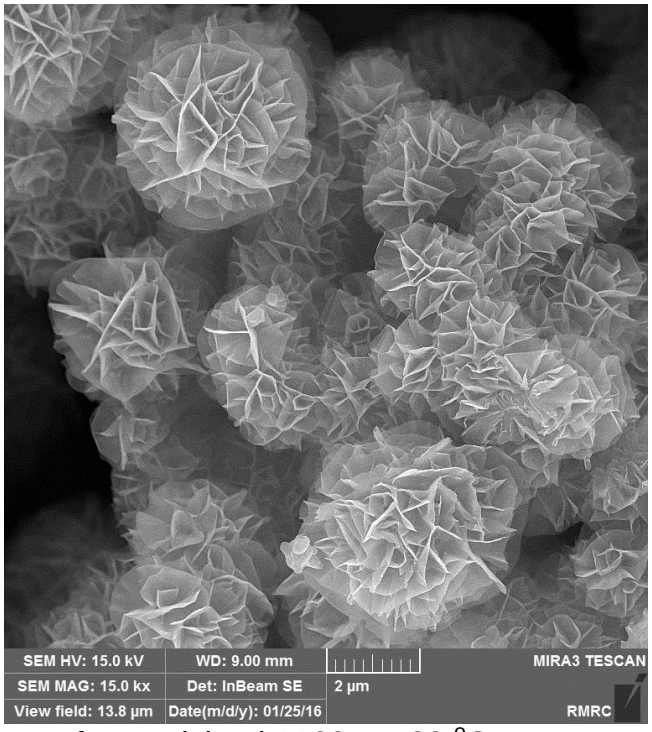


Fig. S23 SEM image from calcined A100 at 100 ^{o}C.

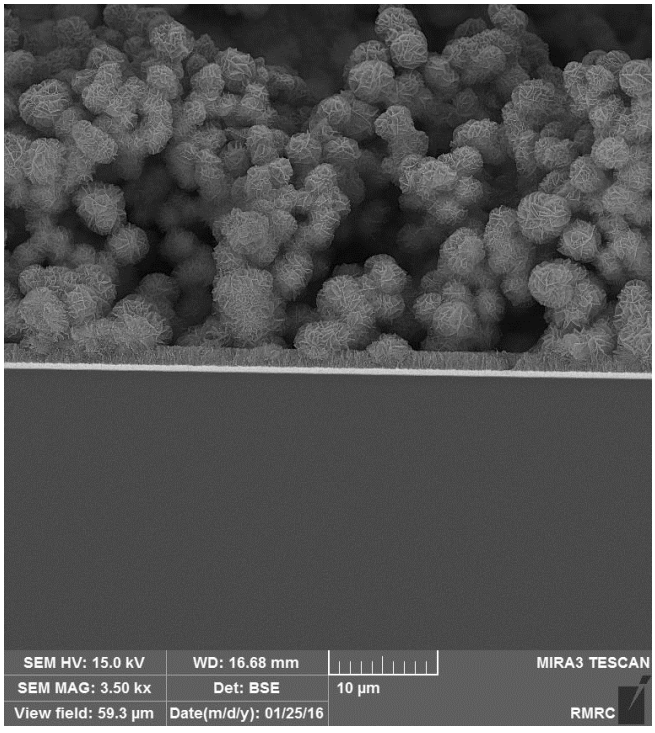


Fig. S24 Cross-section calcined A100 at 100 ^{o}C.

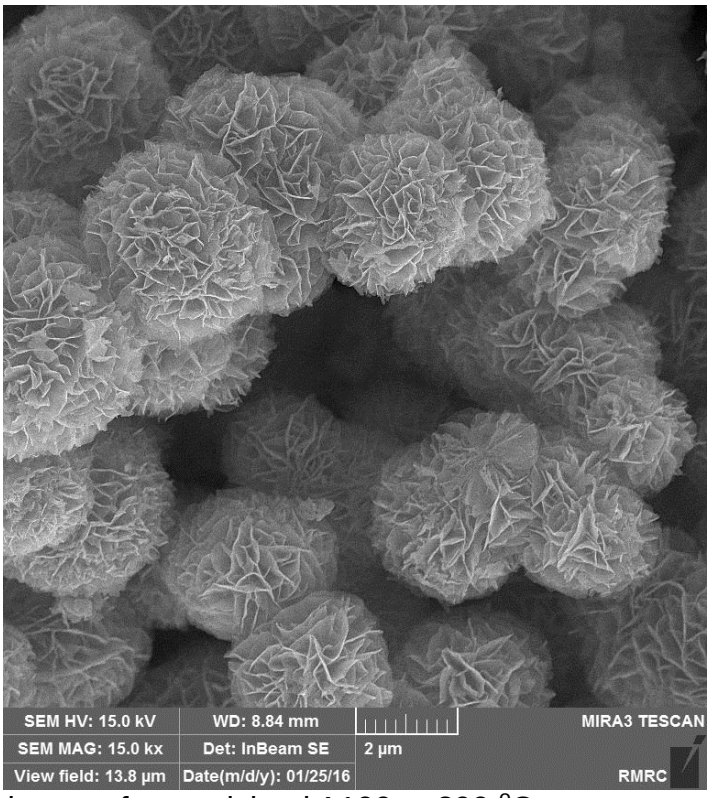


Fig. S25 SEM images from calcined A100 at 200 ^{o}C.

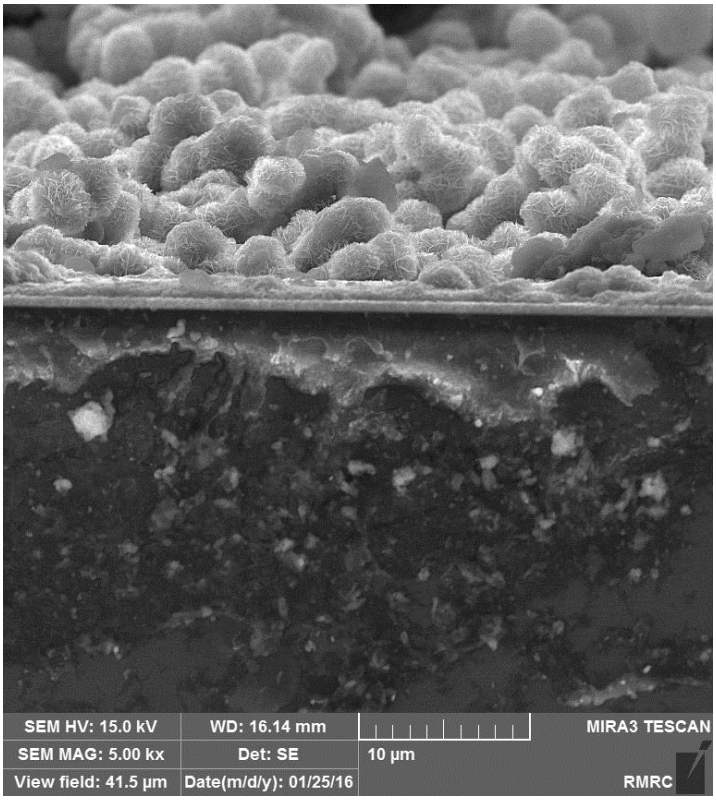


Fig. S26 Cross-section calcined A100 at 200 ^{o}C.

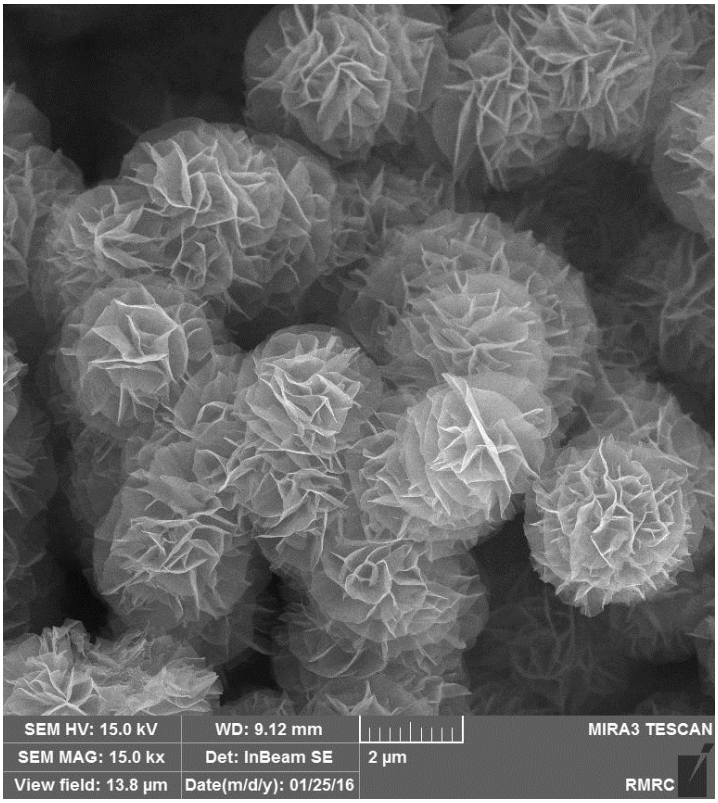


Fig. S27 SEM image from calcined A100 at 300 ^{o}C.

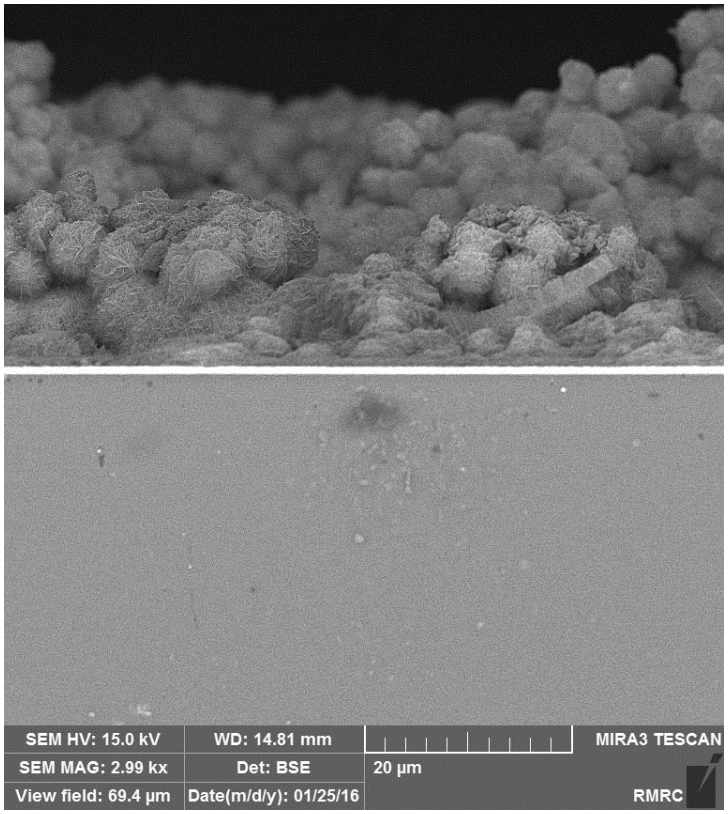


Fig. S28 Cross-section calcined A100 at 300 ^{o}C.

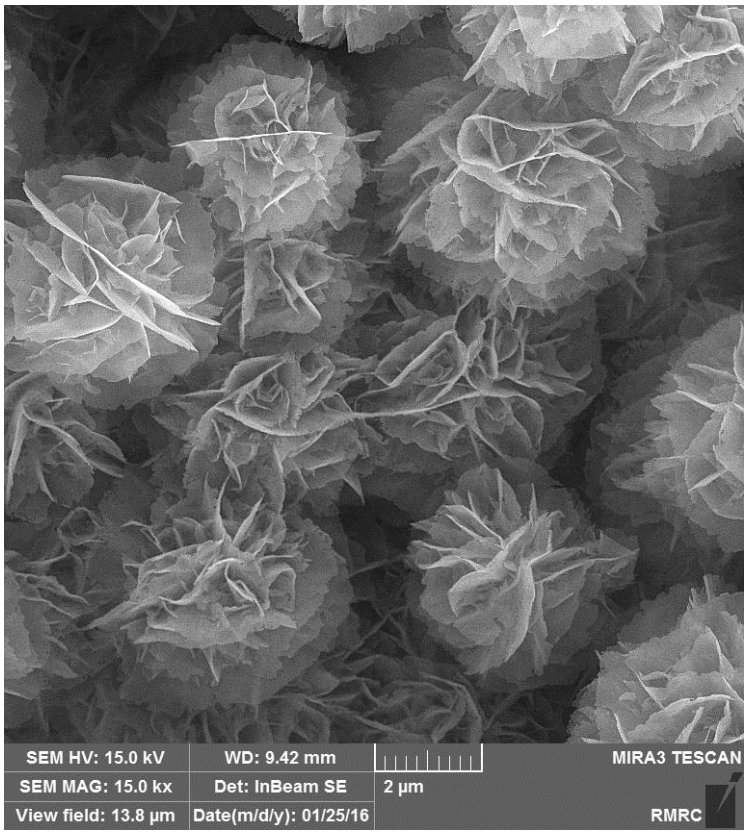


Fig. S29 SEM image from calcined A100 at 400 ^{o}C.

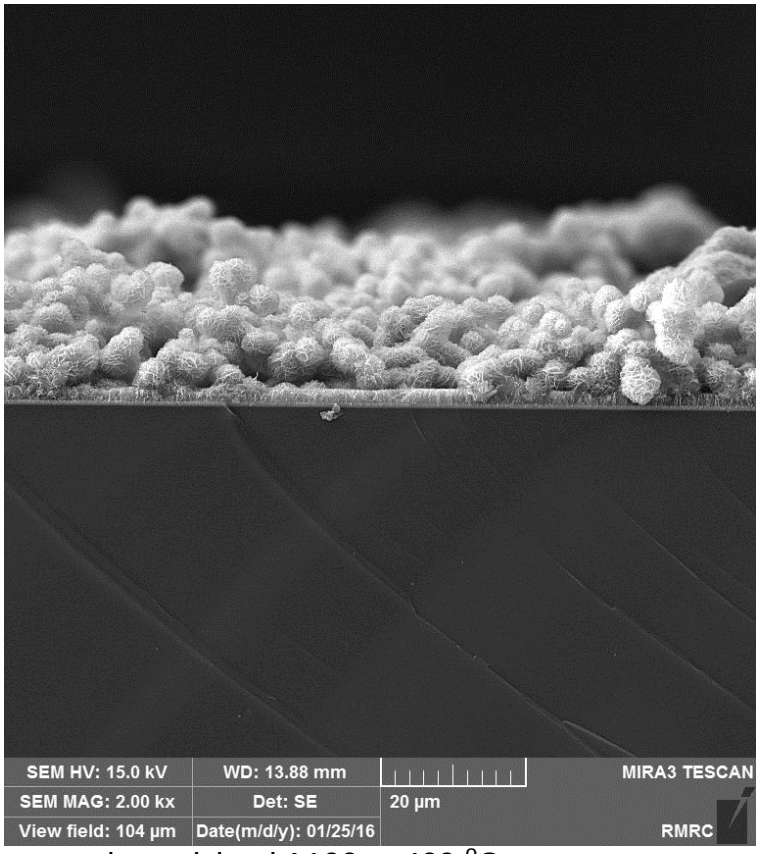


Fig. S30 Cross-section calcined A100 at 400 ^{o}C.

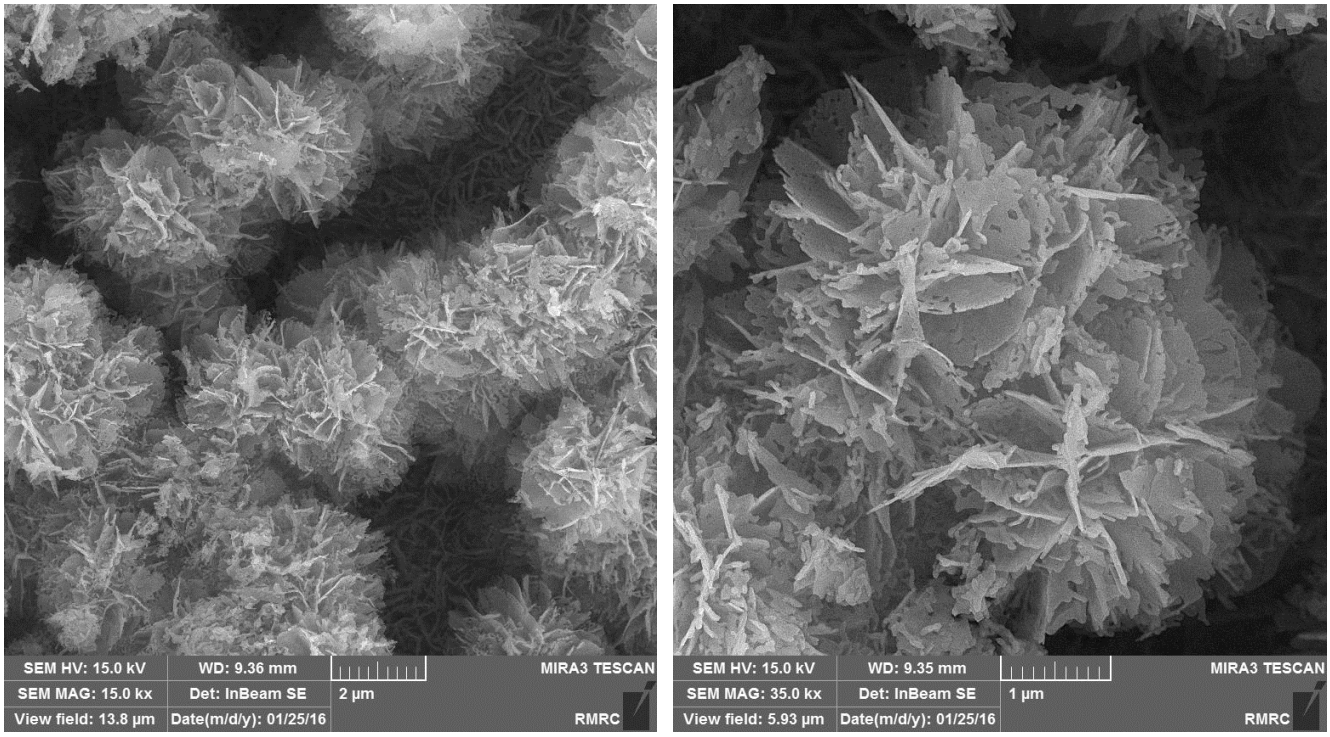


Fig. S31 SEM images from calcined A100 at 500 ^{o}C.

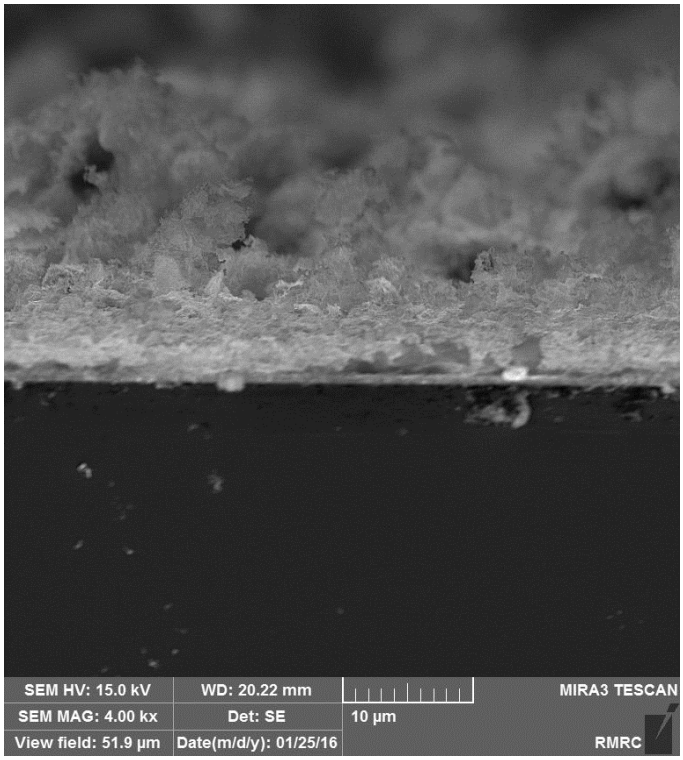
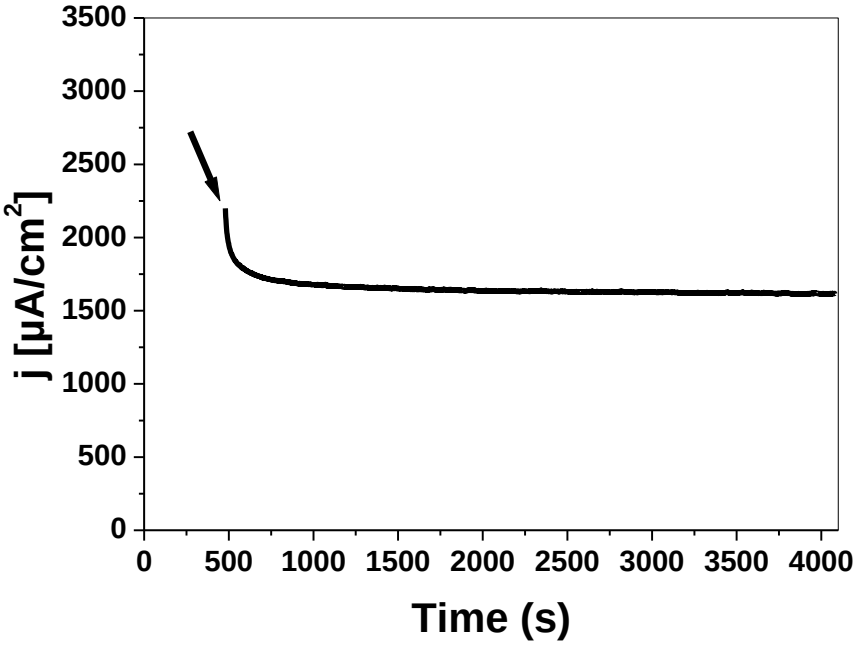
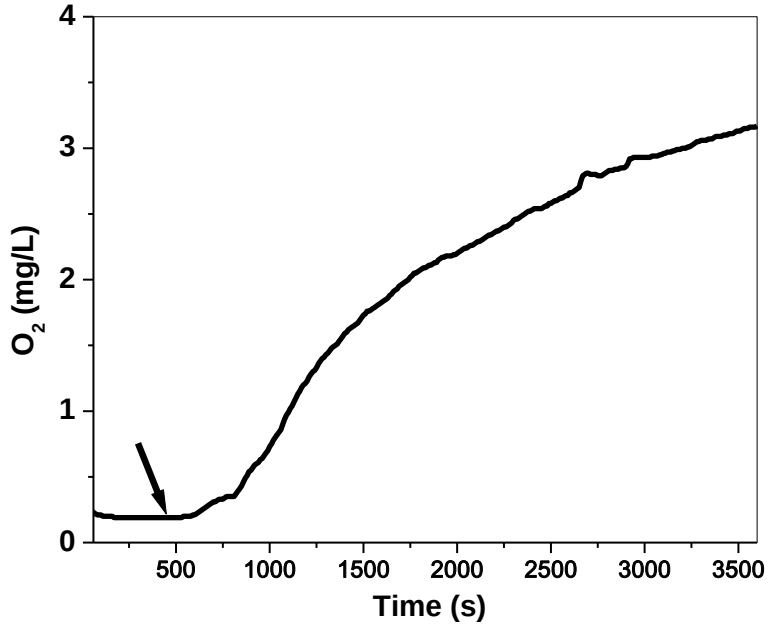


Fig. S32 Cross-section calcined A100 at 500 ^{o}C.



a



b

Fig. S33 Amperometry (a) and oxygen measurement (b) from calcined A100 at 300 °C at 0.75 V (vs. Ag│AgCl). The arrows shows start for the related experiments. Oxygen evolution from aqueous solutions was investigated using an HQ40d portable dissolved oxygen-meter connected to an oxygen monitor with digital readout.