

Electronic Supplementary Information (ESI)

Nanolayered manganese oxides as water-oxidizing catalysts: The effects of Cu(II) and Ni(II) ions

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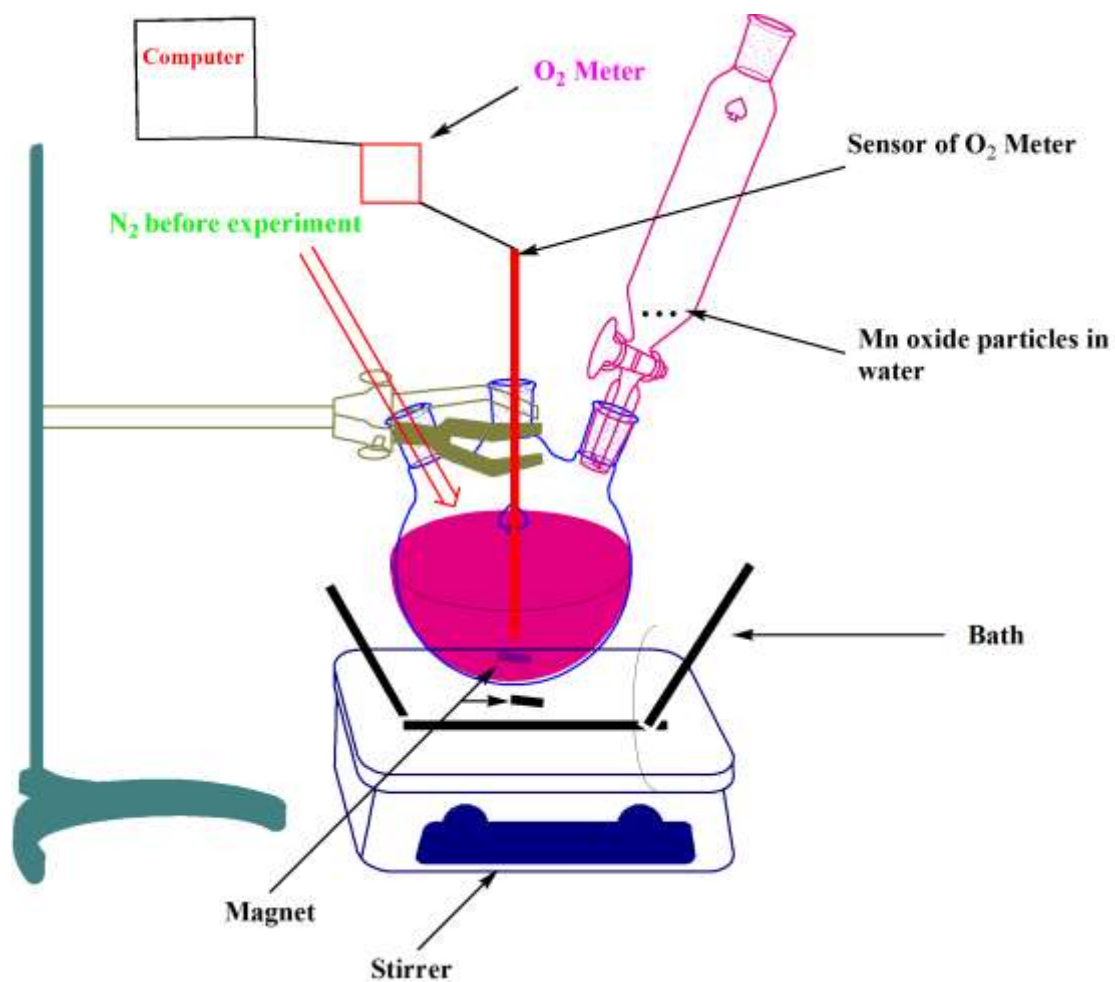
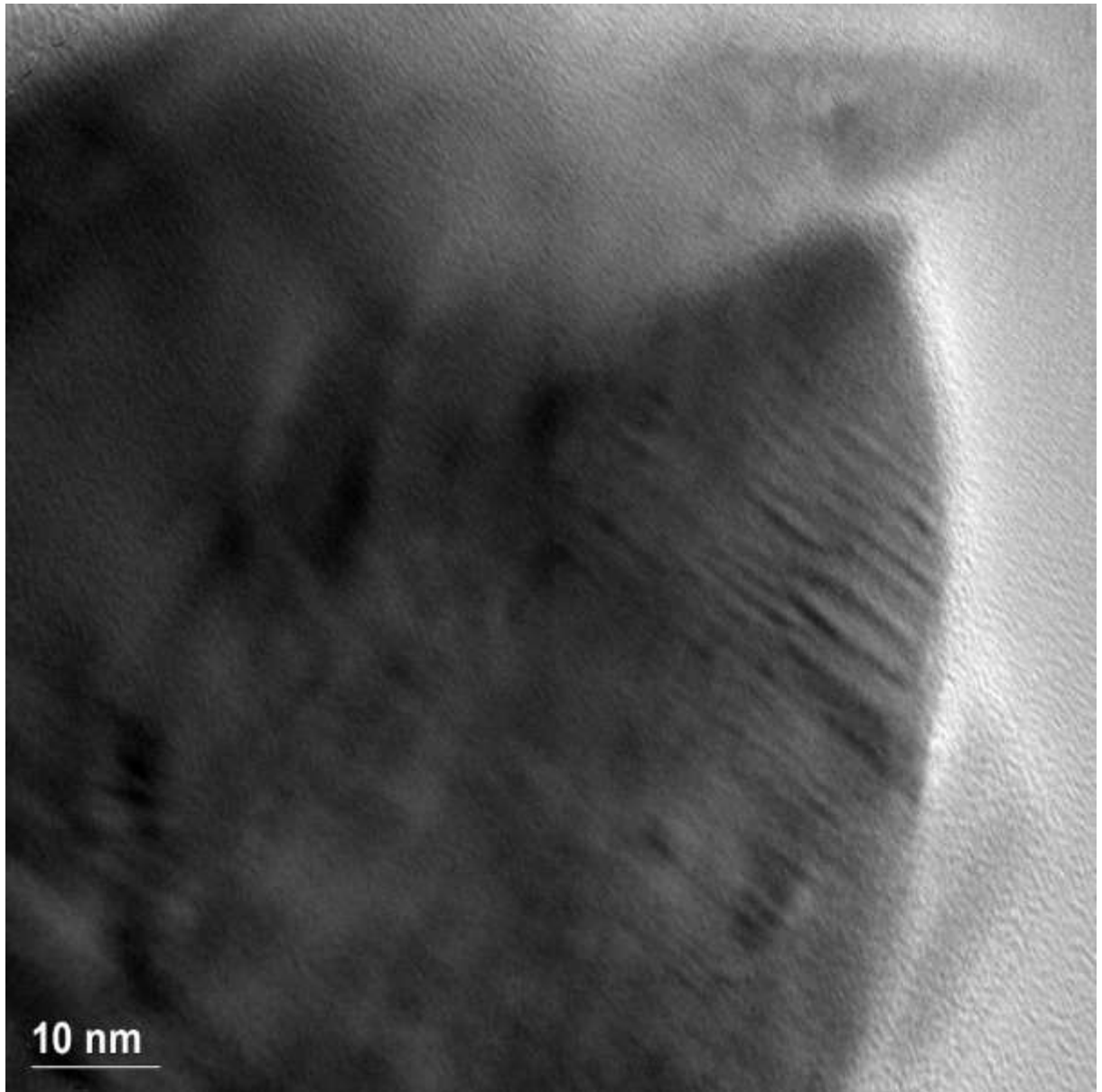
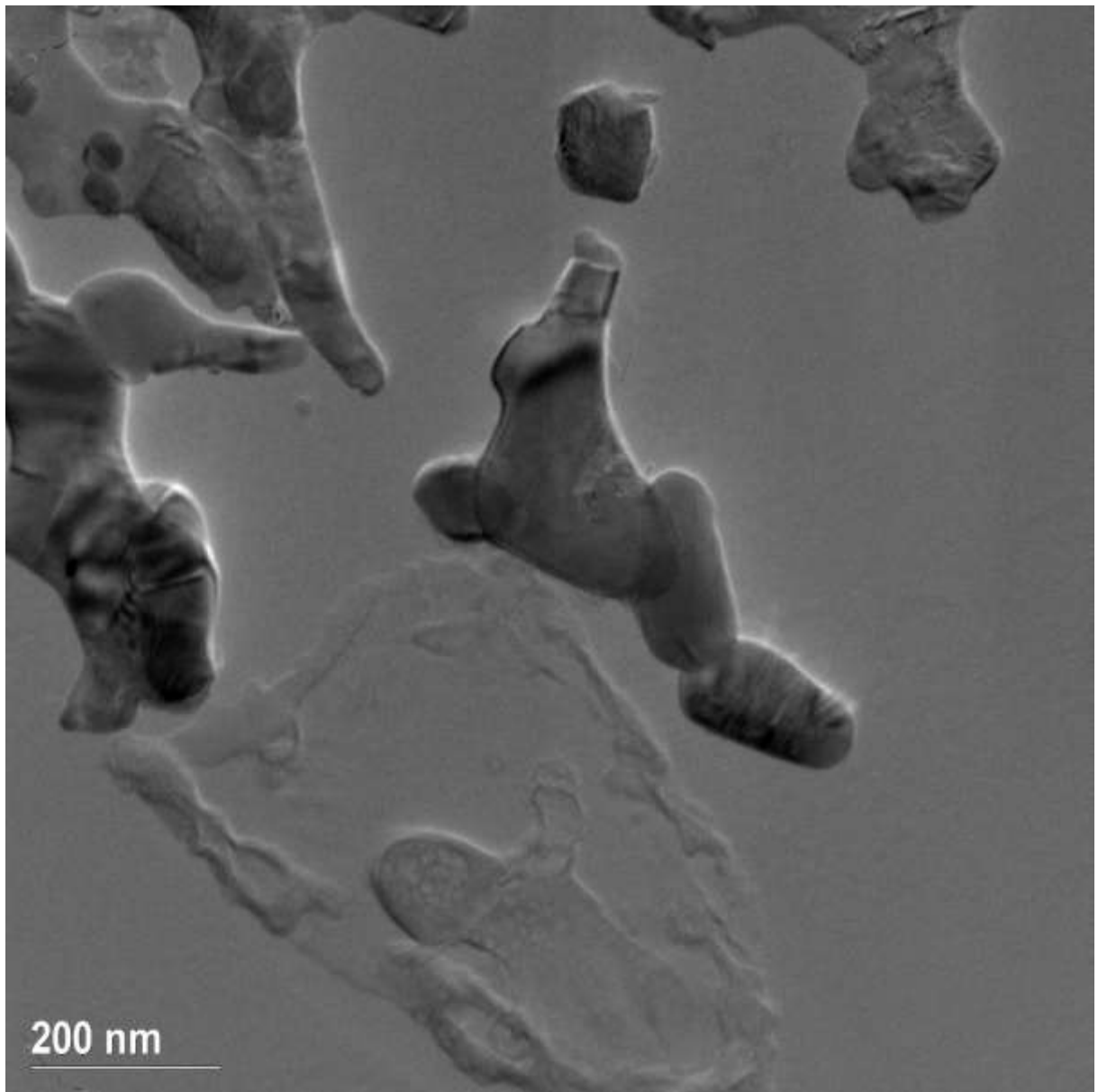


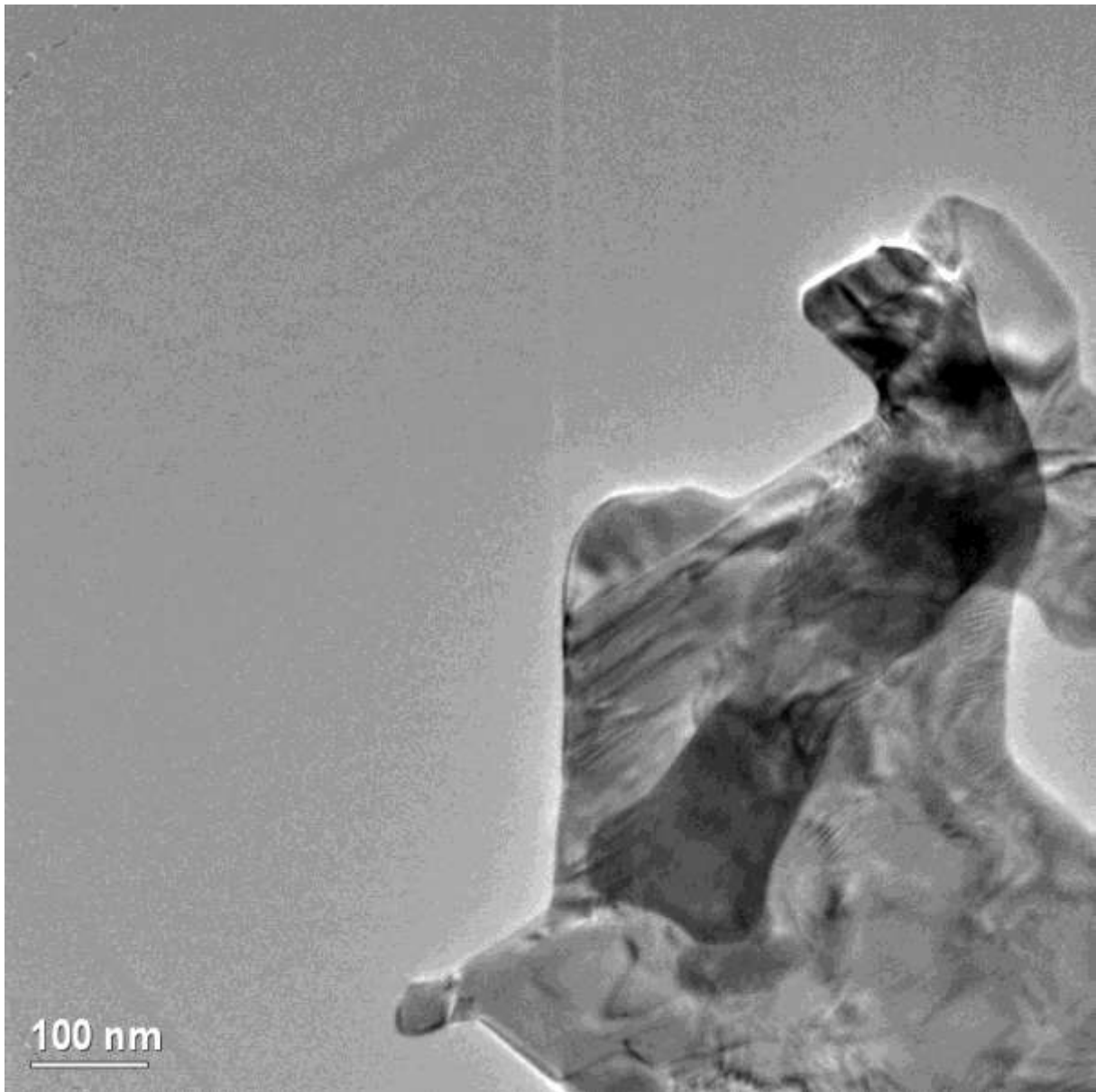
Fig. S1. The reactor set-up for oxygen evolution experiment in the presence of Ce(IV).



a

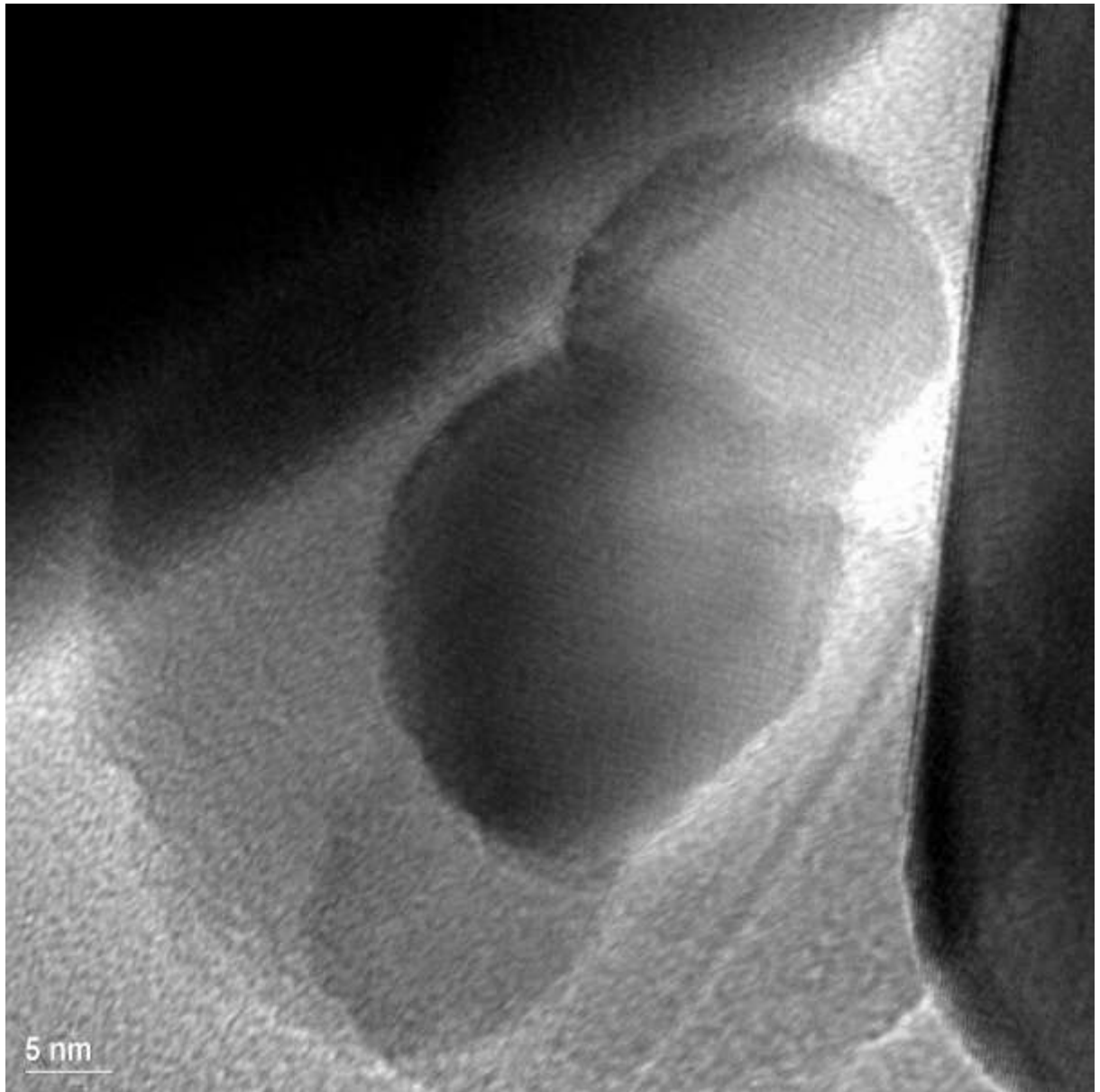


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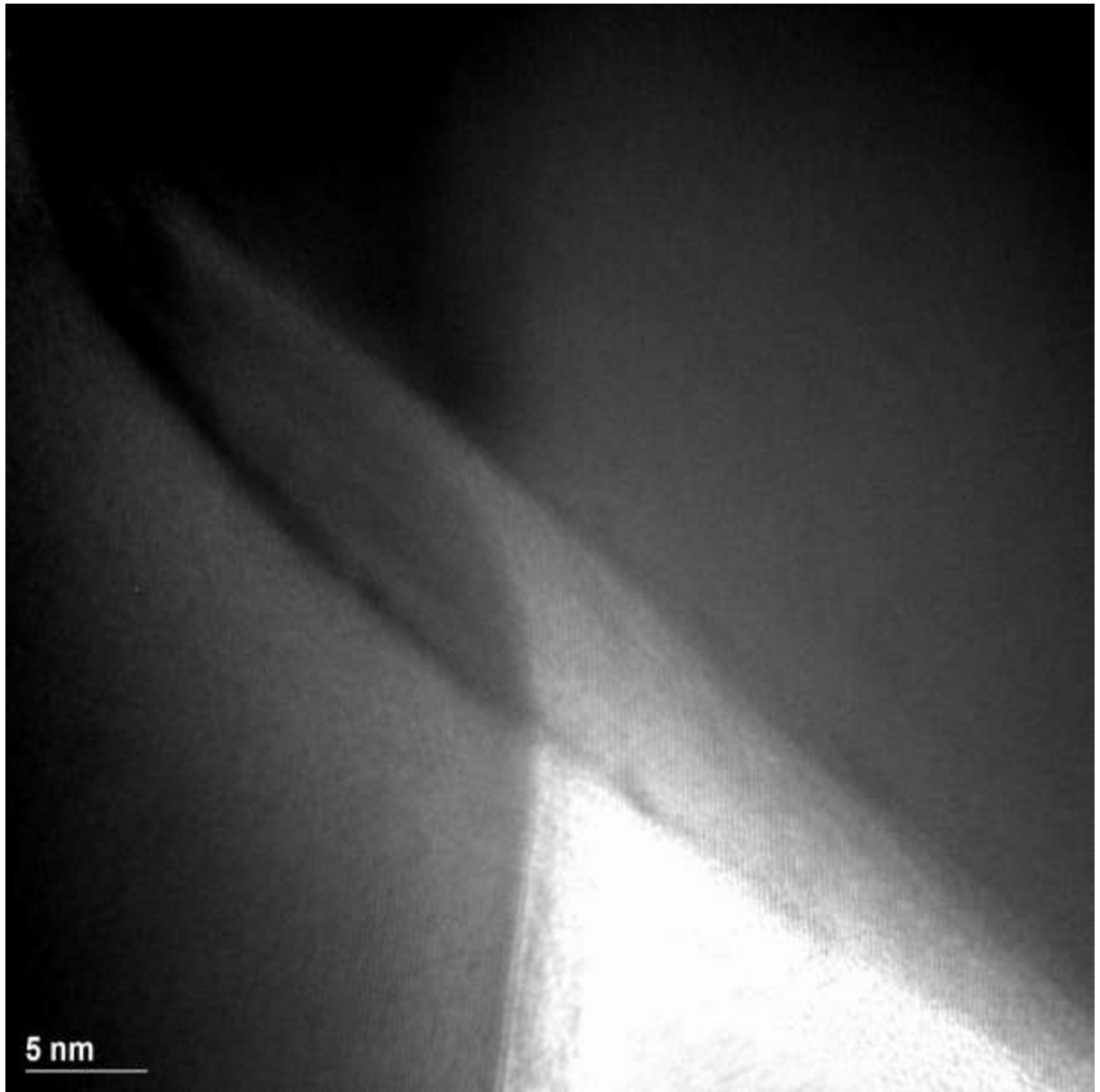


c

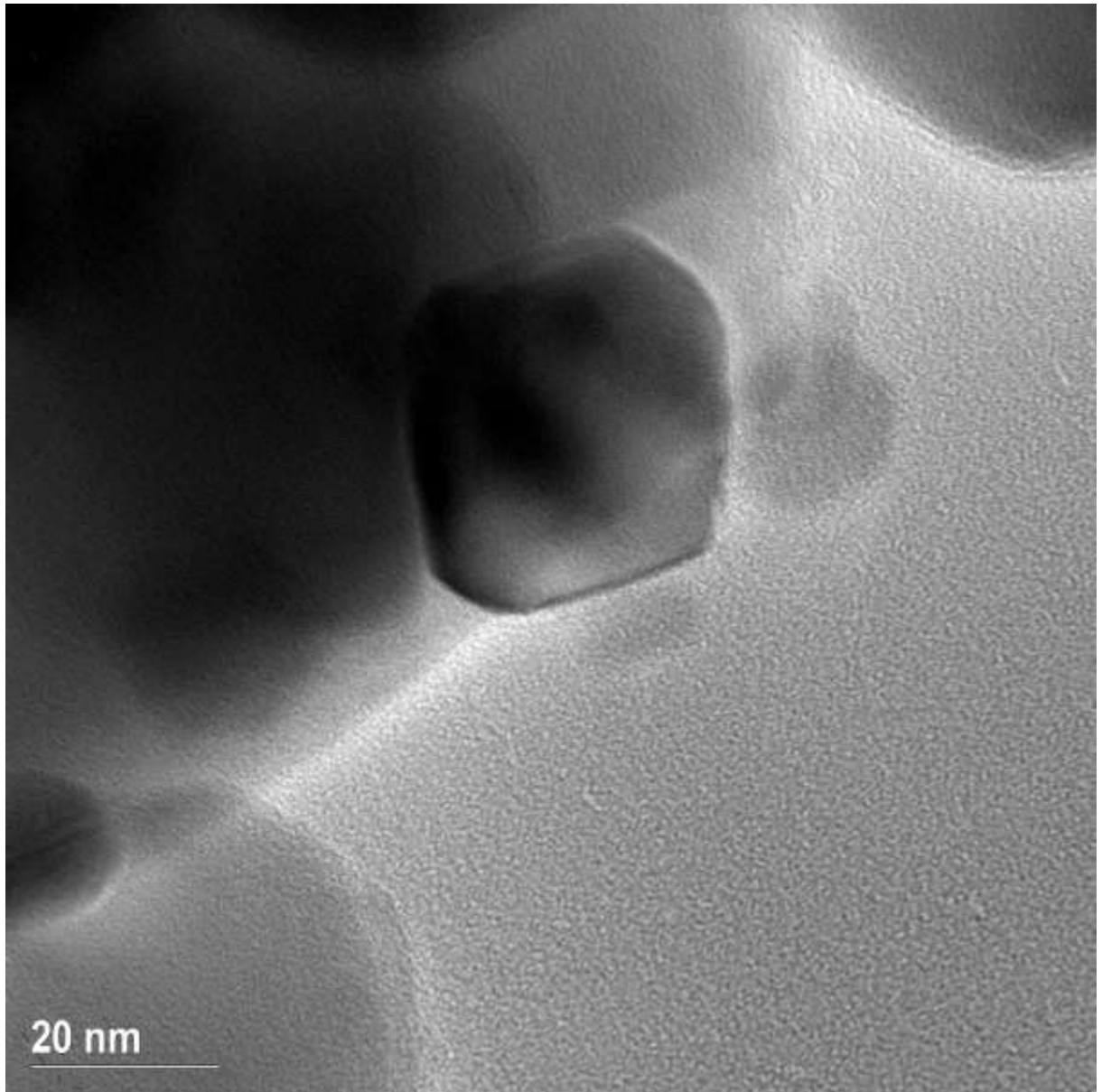
Fig. S2 TEM images for 4-Cu calcinated at 200 °C.



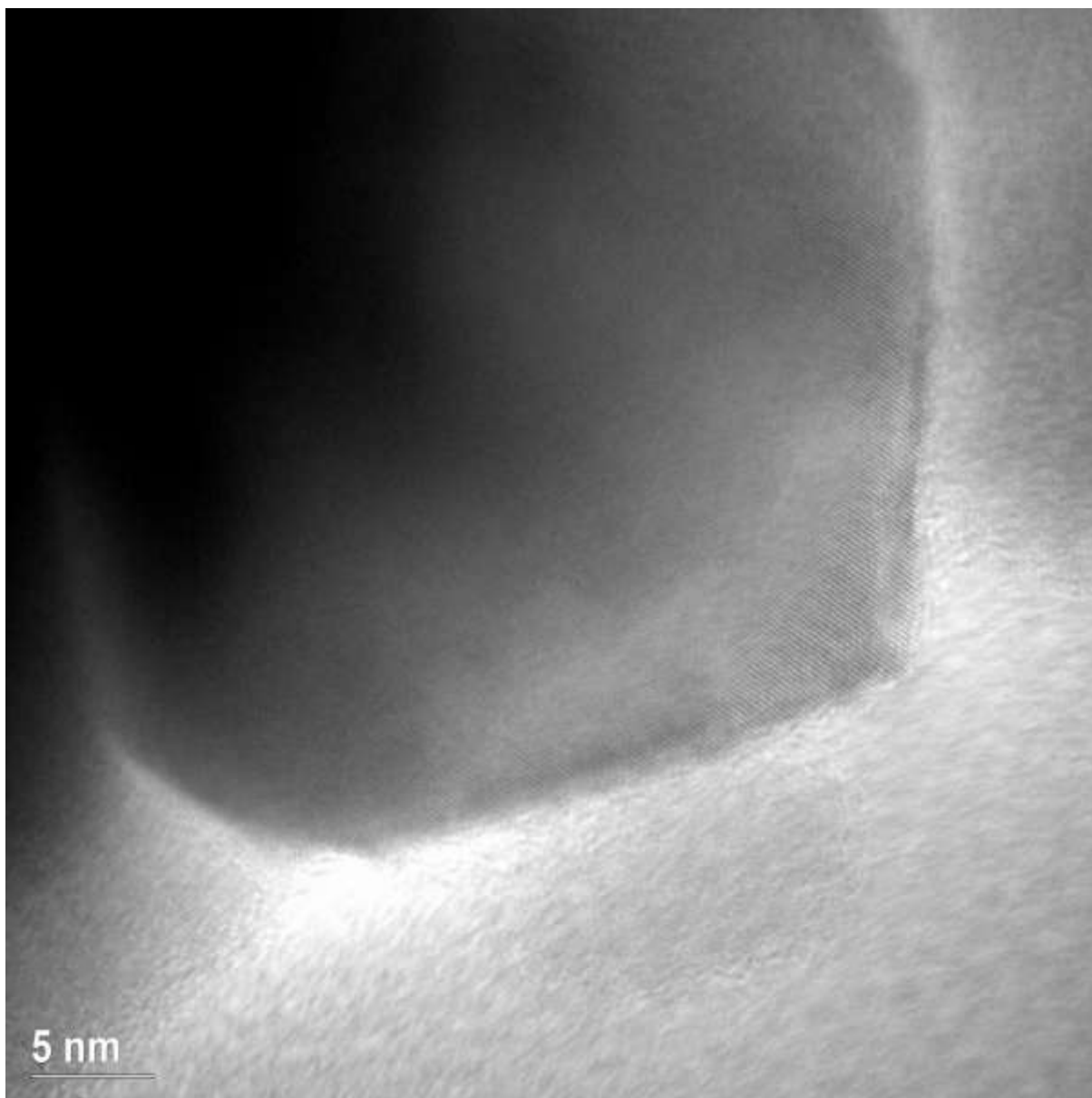
a



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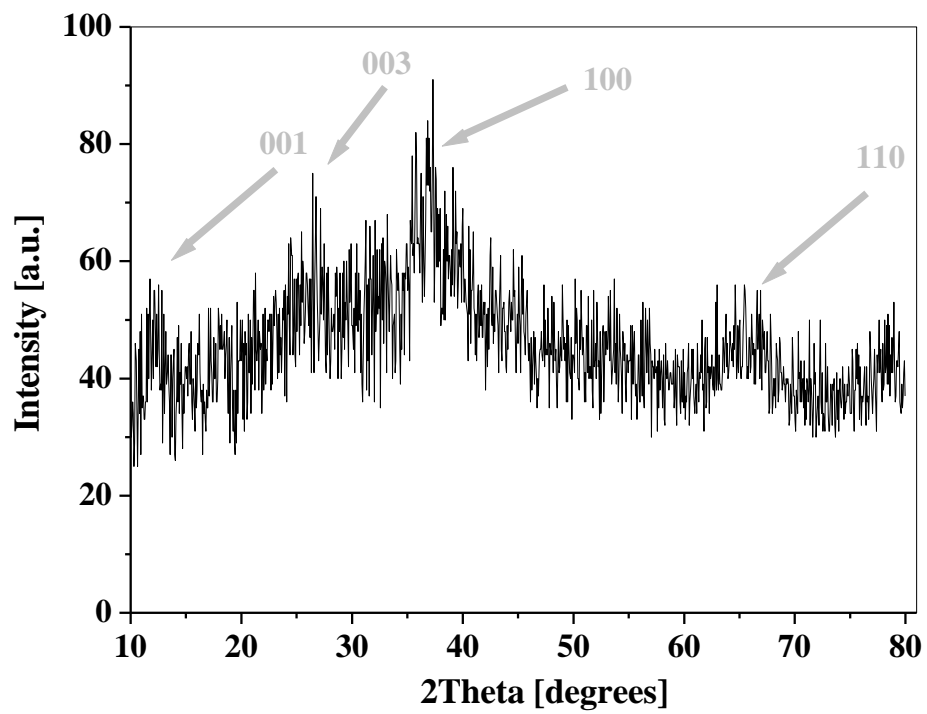


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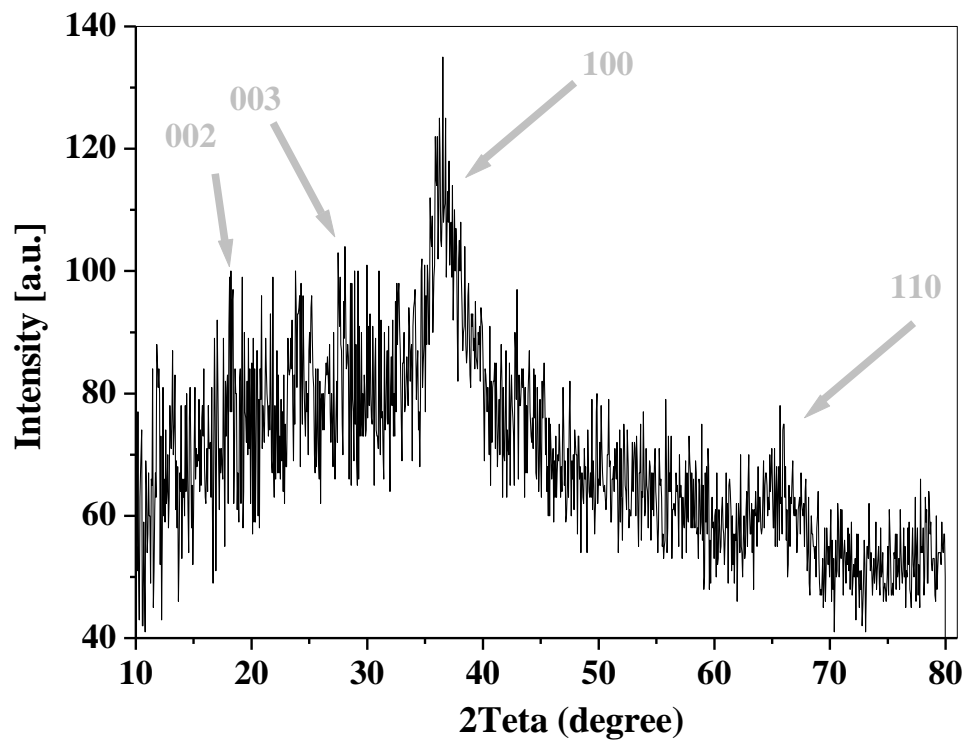


d

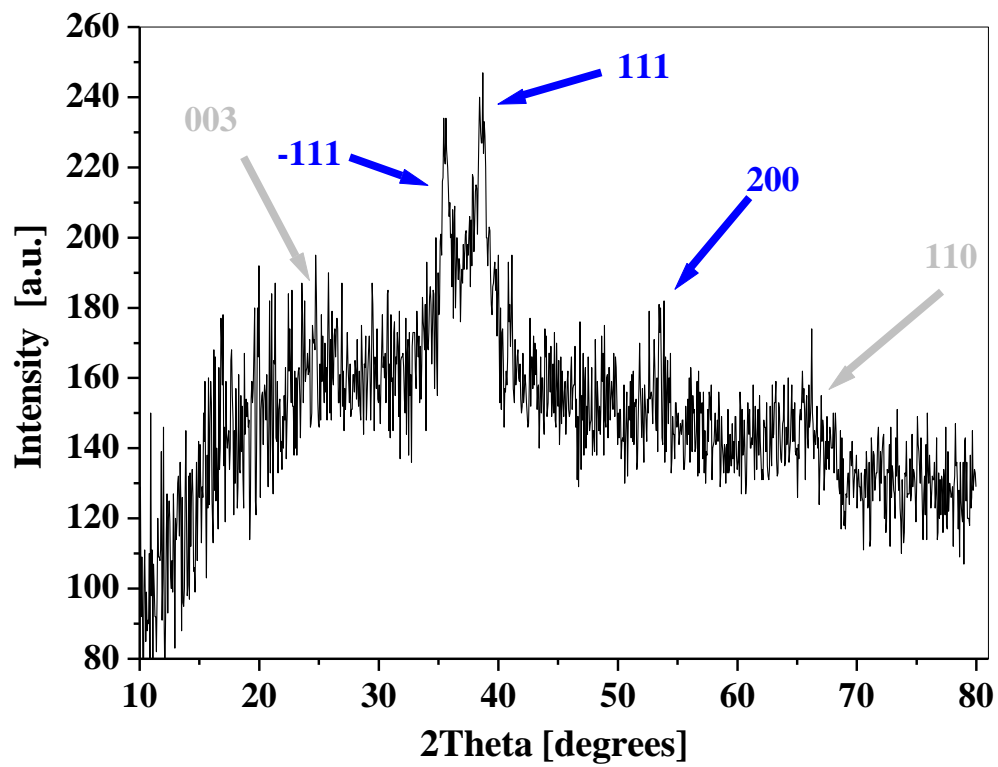
Fig. S3 TEM images for 4-Ni calcinated at 400 °C.



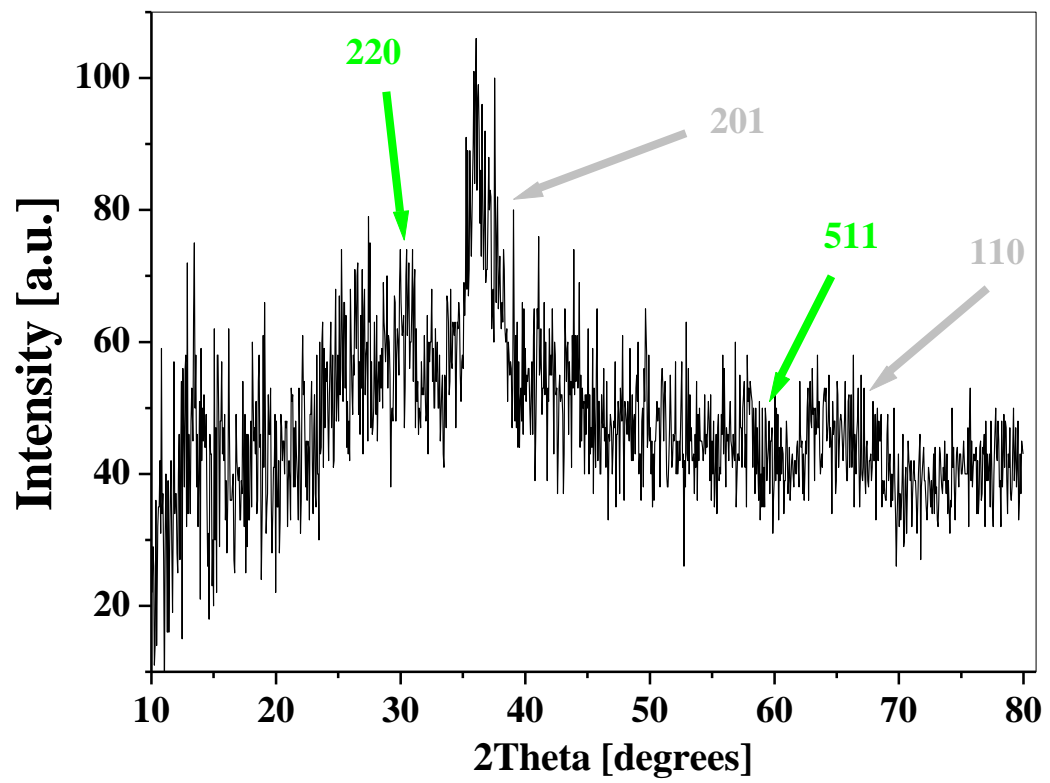
a



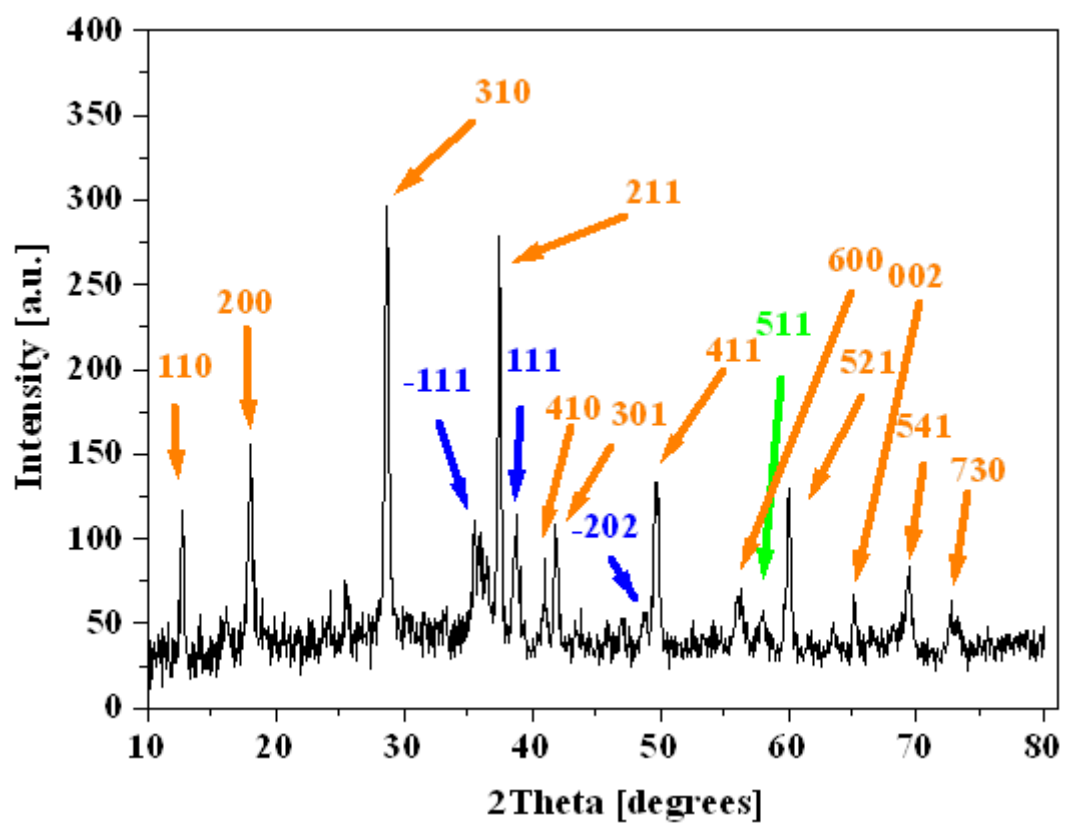
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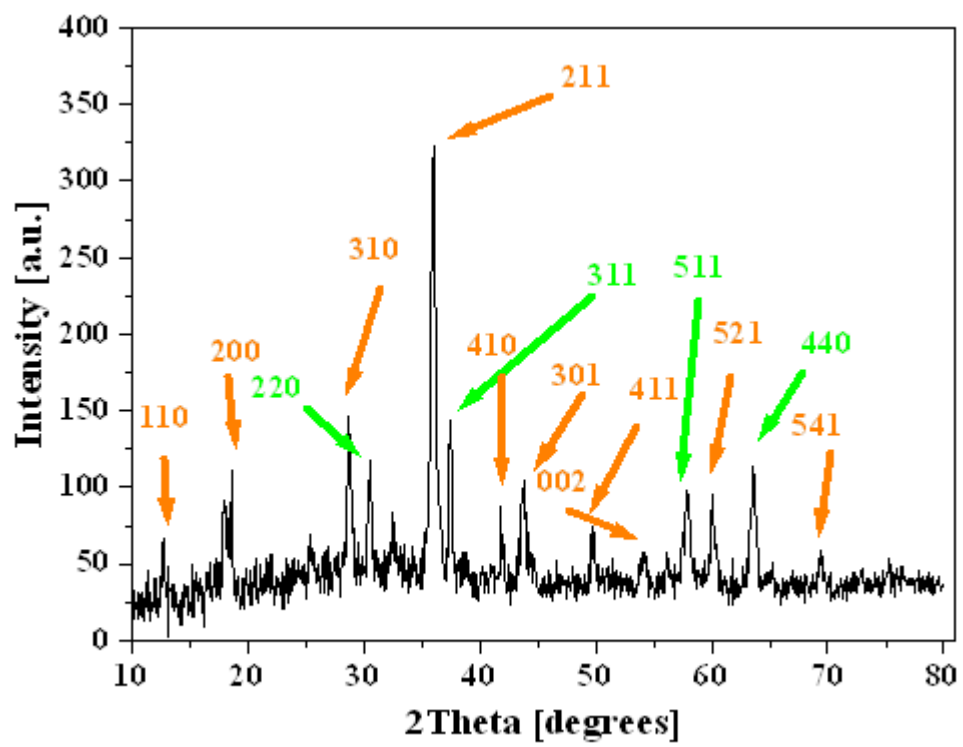
c



d



e



f

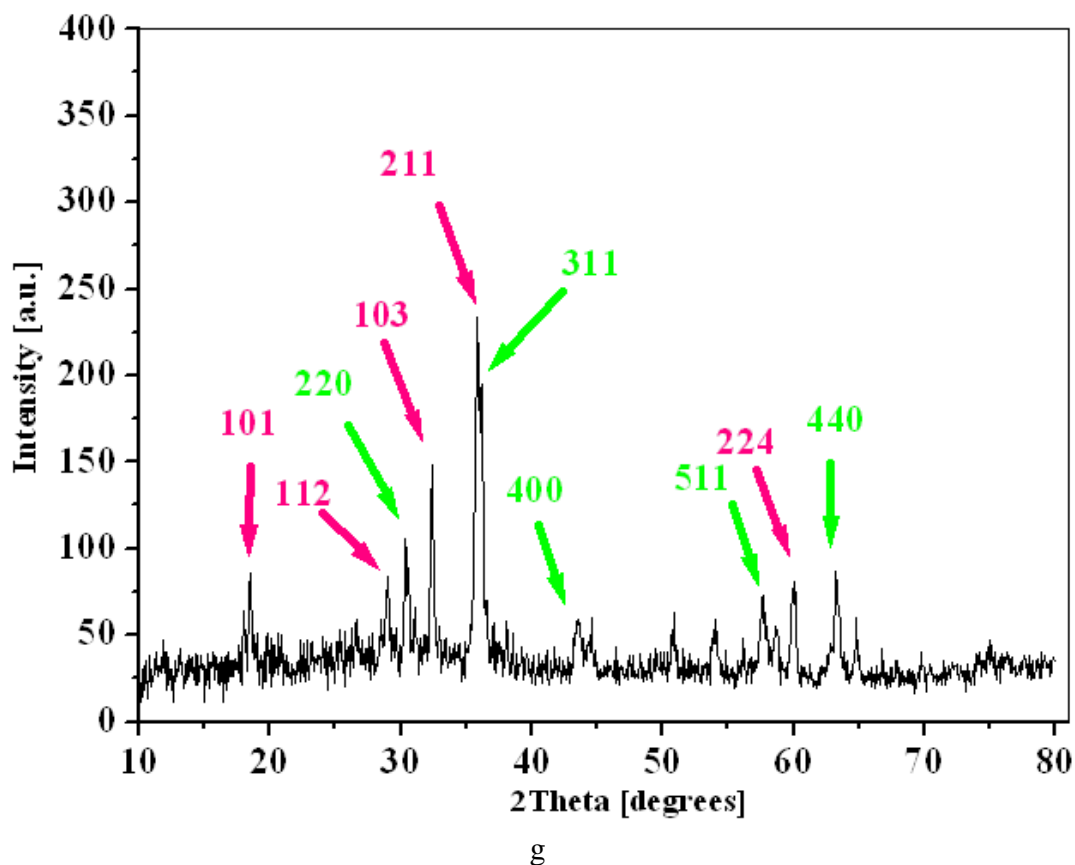
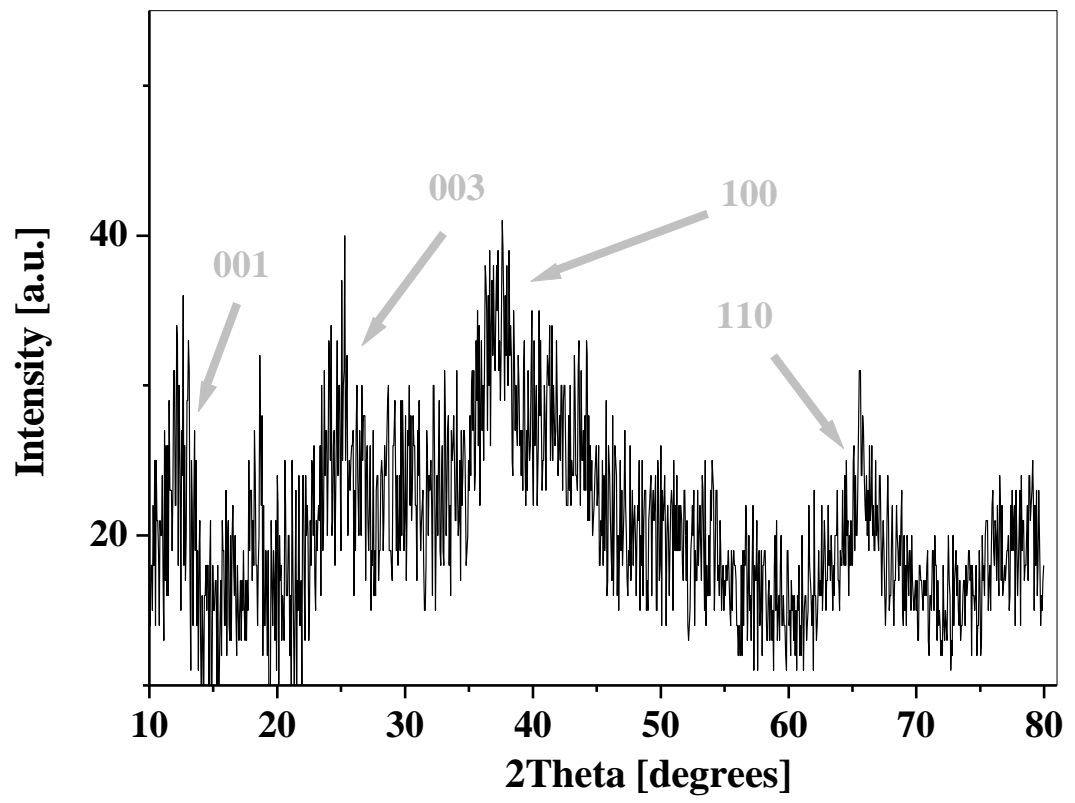
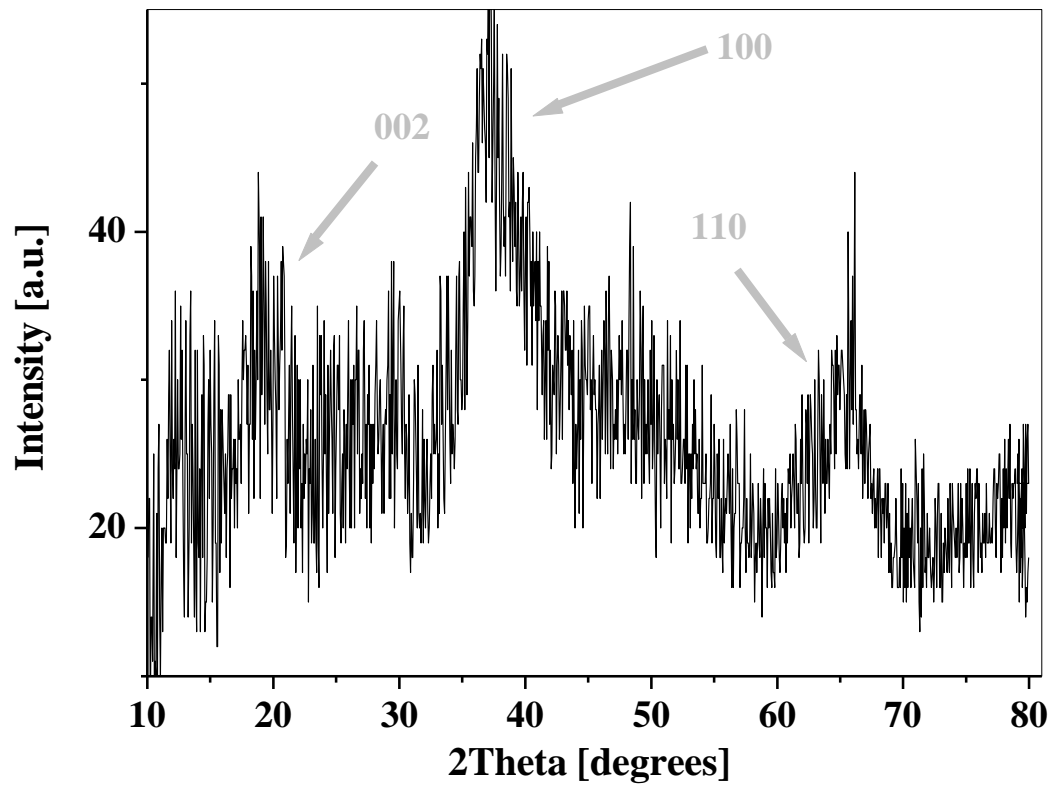


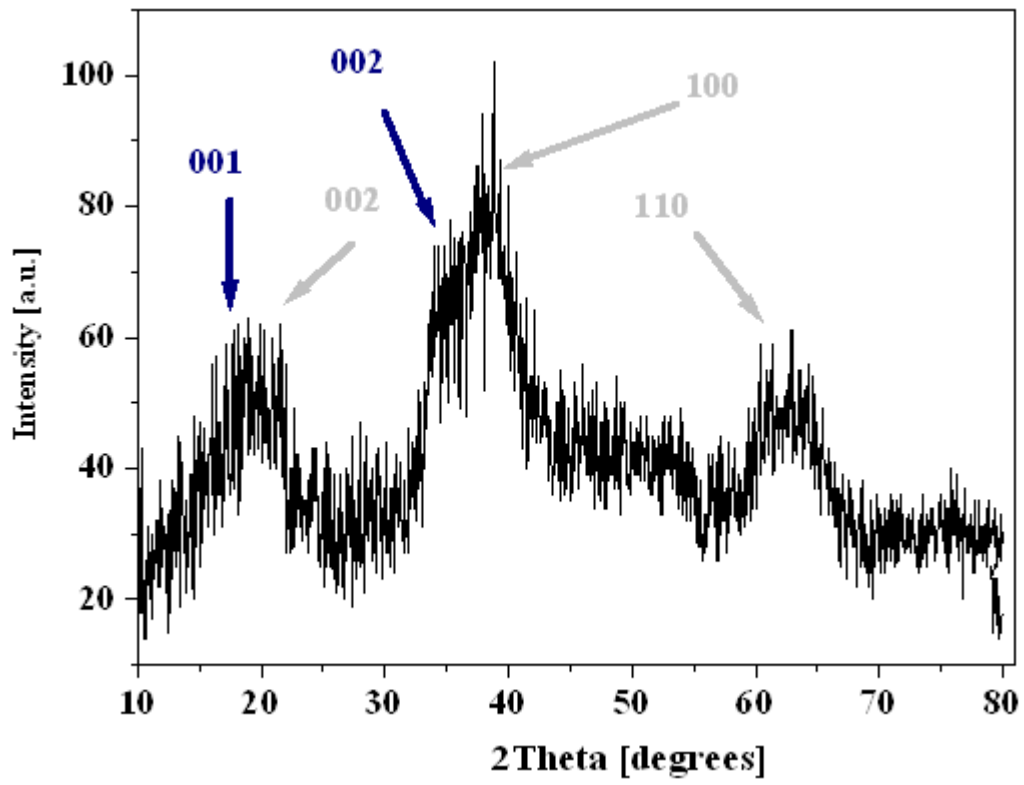
Fig. S4 XRD patterns for **3-Cu** (a), **5-Cu** (b) and **7-Cu** (c). **4-Cu** at calcinated at 300 (d), 500 (e), 600 (f) and 700 (g) °C. Grey patterns for a-d show layered Mn oxide. In c, pattern (blue arrows) for CuO is also observed. CuMn₂O₄ (green arrows) is observed in d. e contains KMn₈O₁₆ (orange arrows), CuO (blue arrows) and CuMn₂O₄ (green arrows). In f, KMn₈O₁₆ (orange arrows) and CuMn₂O₄ (green arrows) are detected. In g, Mn₃O₄ (pink arrows) and CuMn₂O₄ (green) arrows are observed.



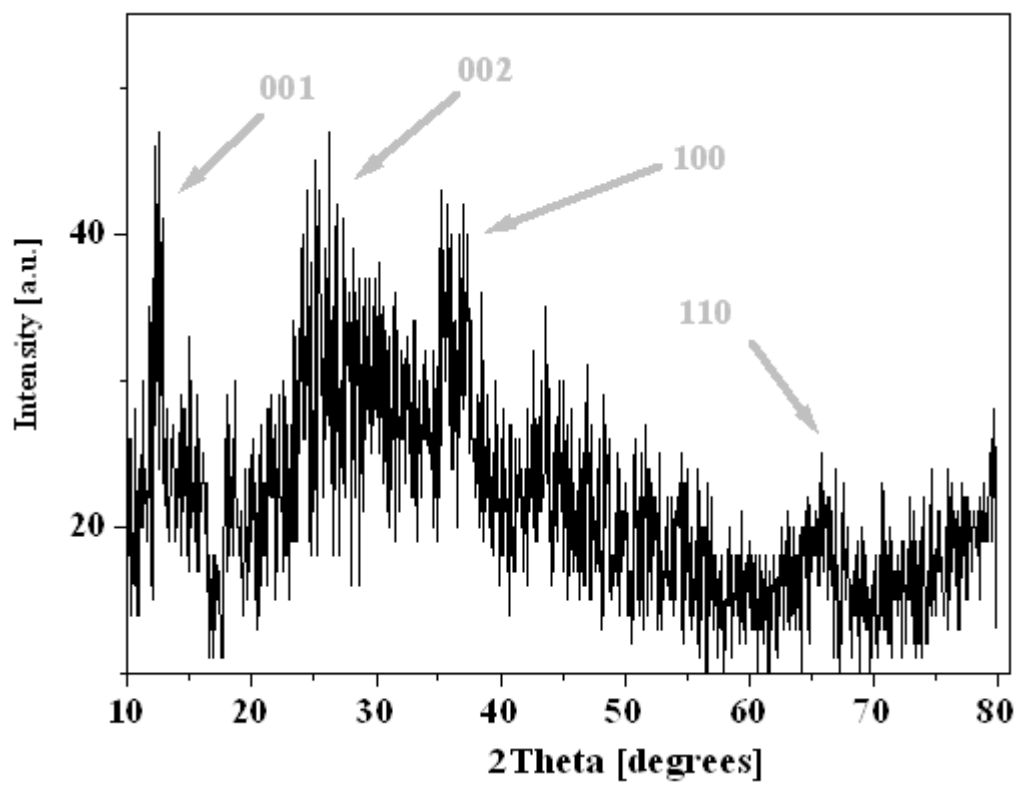
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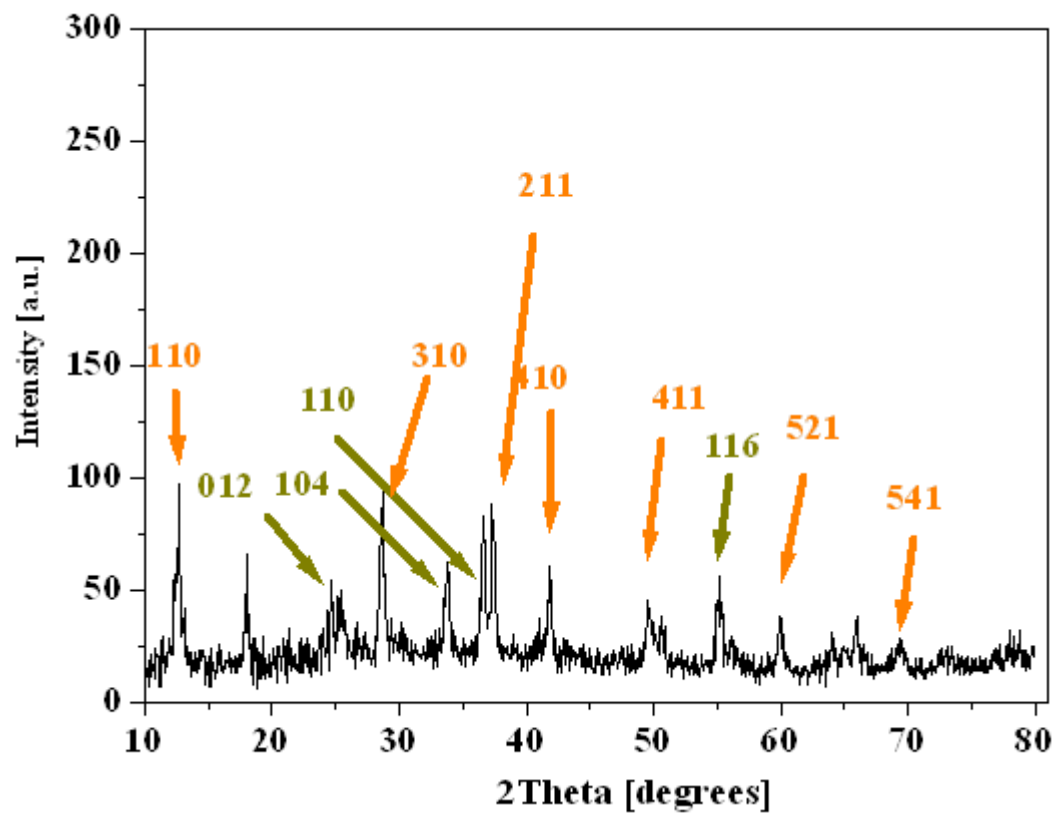
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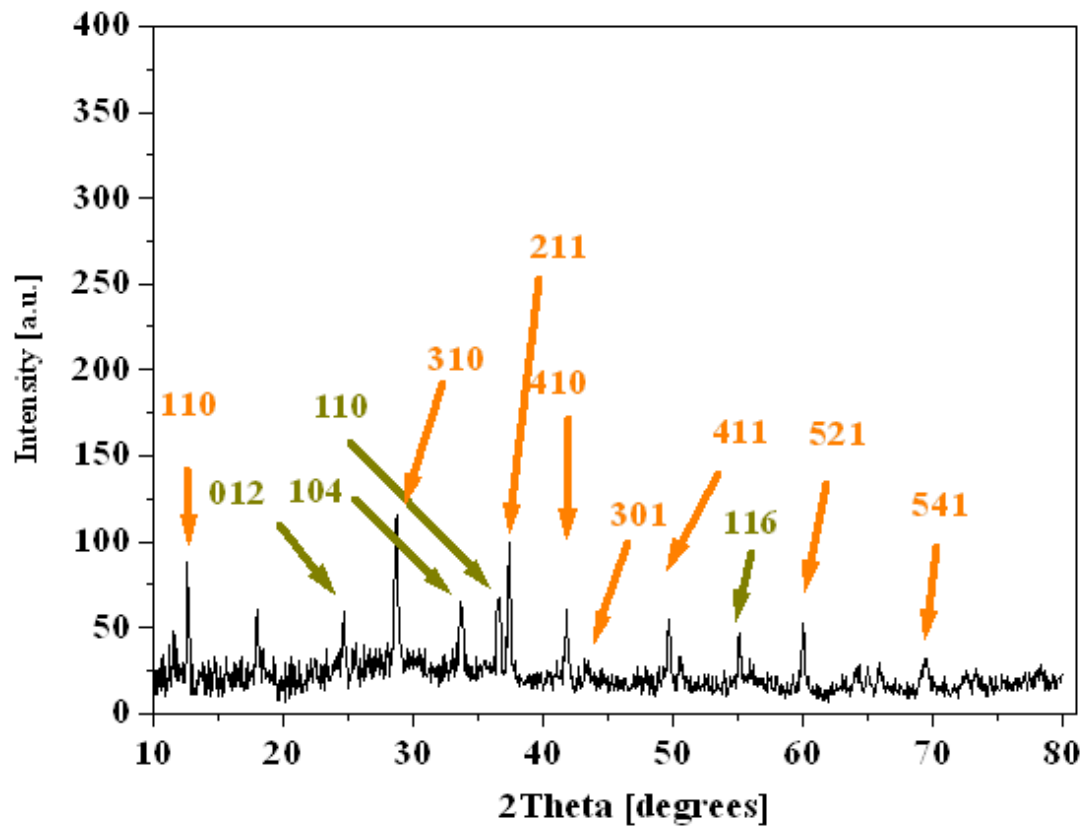
c



d



e



f

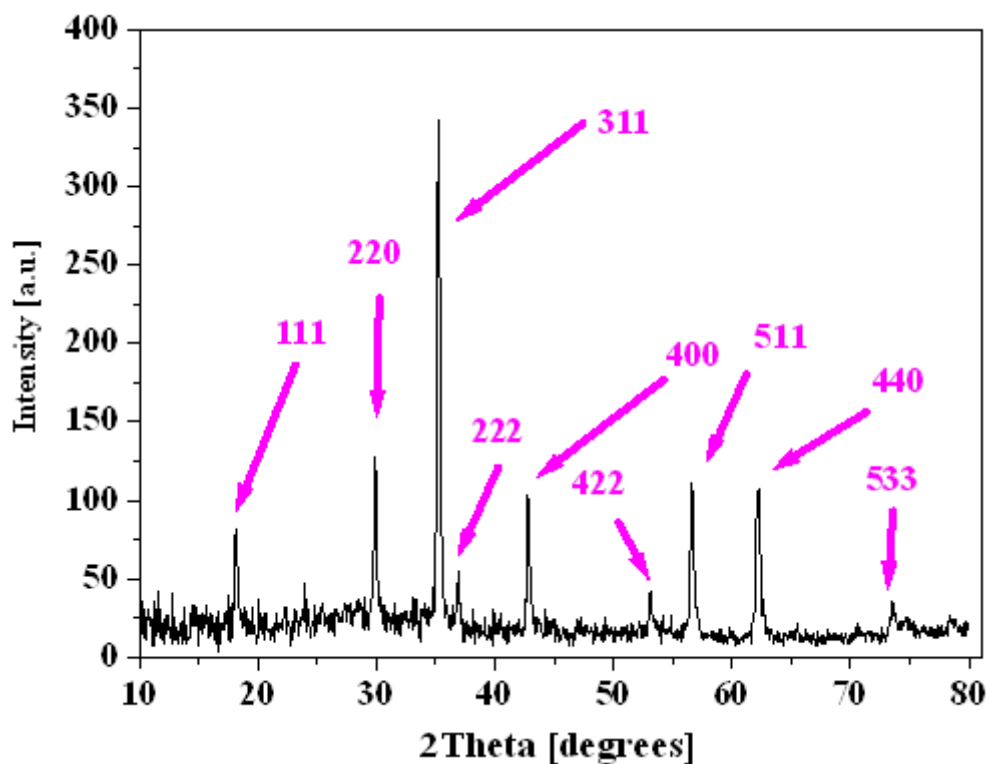
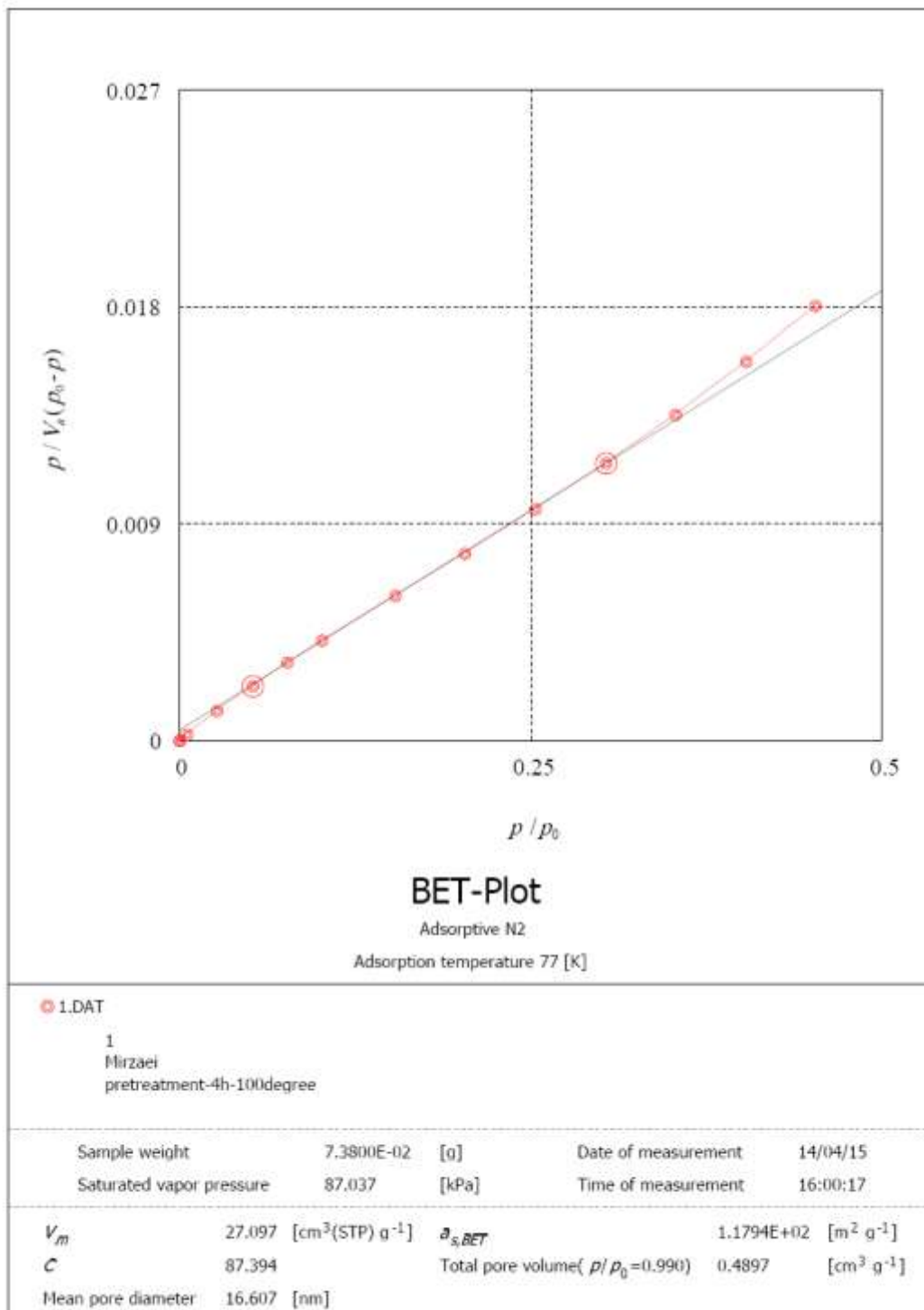
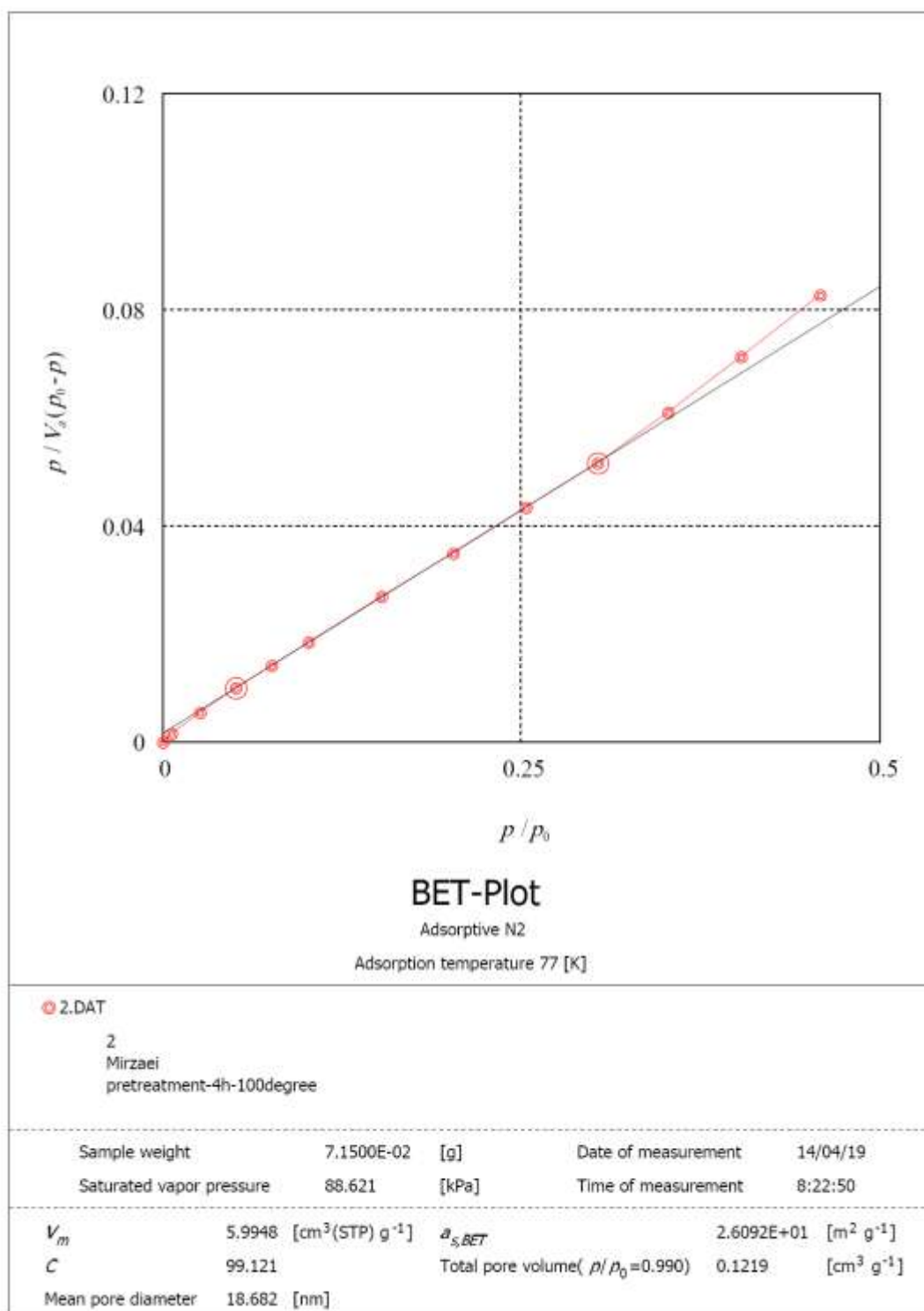


Fig. S5 XRD patterns for **3-Ni** (a), **5-Ni** (b) and **7-Ni** (c). **4-Ni** calcinated at 300 (d), 500 (e), 600 (f) and 700 (g) °C. Grey patterns for a-d show layered Mn oxide. In c, pattern (blue arrows) for Ni(OH)₂ is also observed. e and f contain KMn₈O₁₆ (orange arrows) and NiMnO₃ (green arrows). In g, NiMn₂O₄ (pink arrows) is detected.



(a)



(b)

Fig. S6 BET results for **4**-Cu (a) and **4**-Ni (b).