

Electronic Supplementary Information

Water oxidation by Ni(1,4,8,11-tetraazacyclotetradecane)²⁺ in the presence of carbonate: New findings and an alternative mechanism

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Sample Name	% C	% H	% N	% S
1	26.32	5.62	12.47	-

Table S1 CHNS analysis report for **1**. Theoretical amounts are 26.23, 5.28 and 12.24 for % C, % H and % N, respectively.

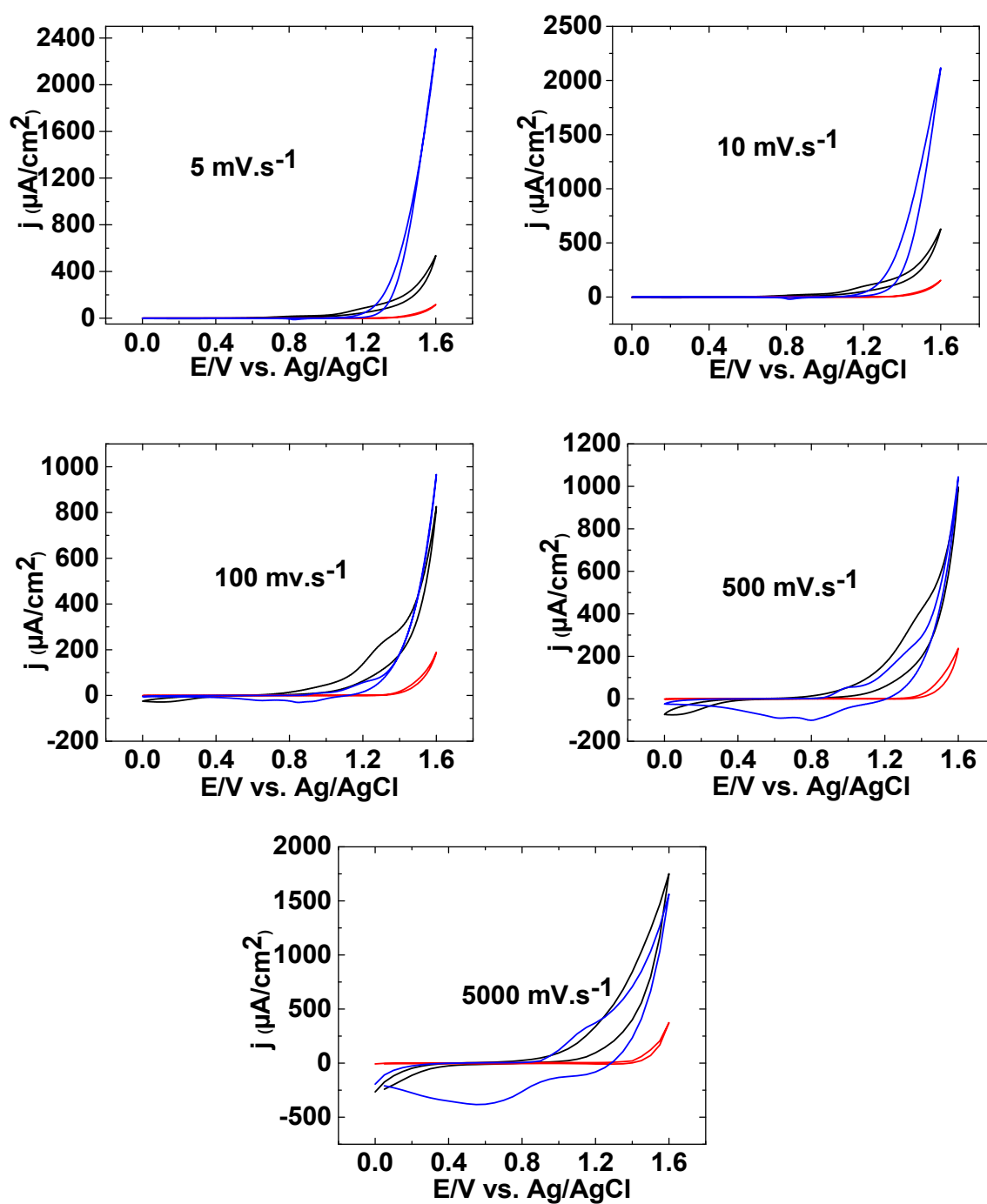


Figure S1 CV with different scan rates for **1** (1.0 mM) (black), FTO (red) and Ni salt (1.0 mM) (blue).

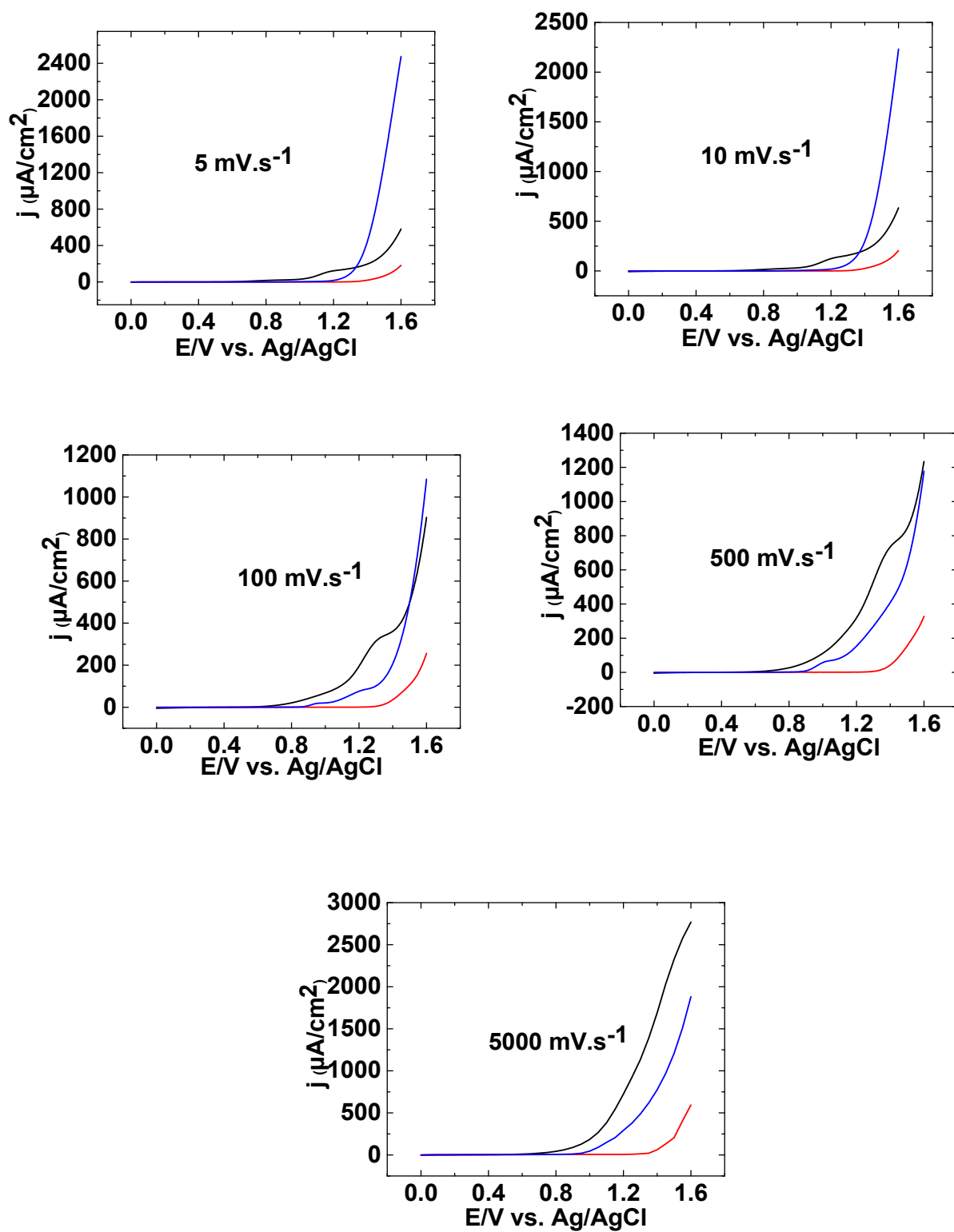


Figure S2 LCV with different scan rates for **1** (1.0 mM) (black), FTO (red) and Ni salt (1.0 mM) (blue).

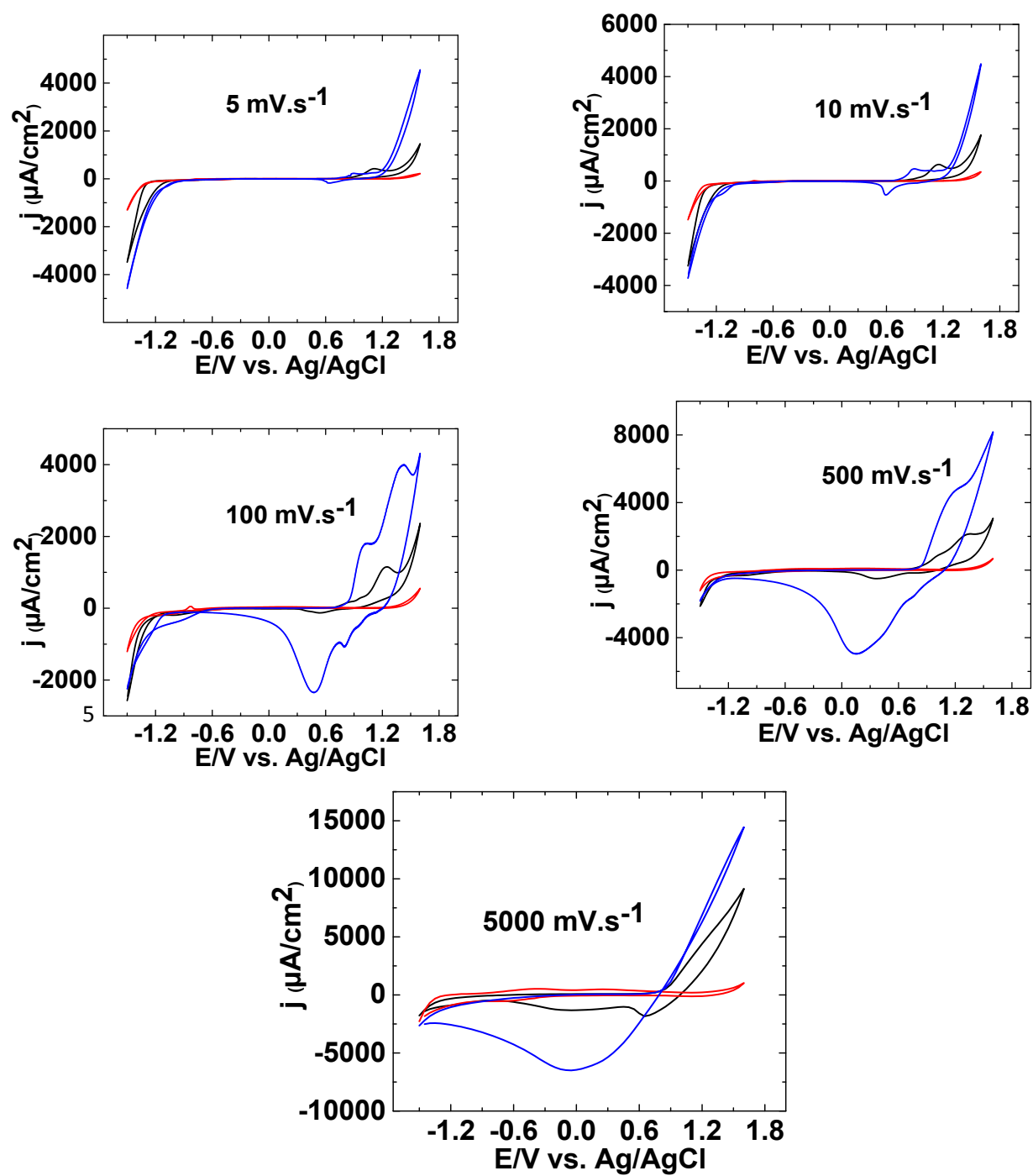


Figure S3 CV with different scan rates for **1** (1.0 mM) (black), FTO (red) and Ni salt (1.0 mM) (blue).

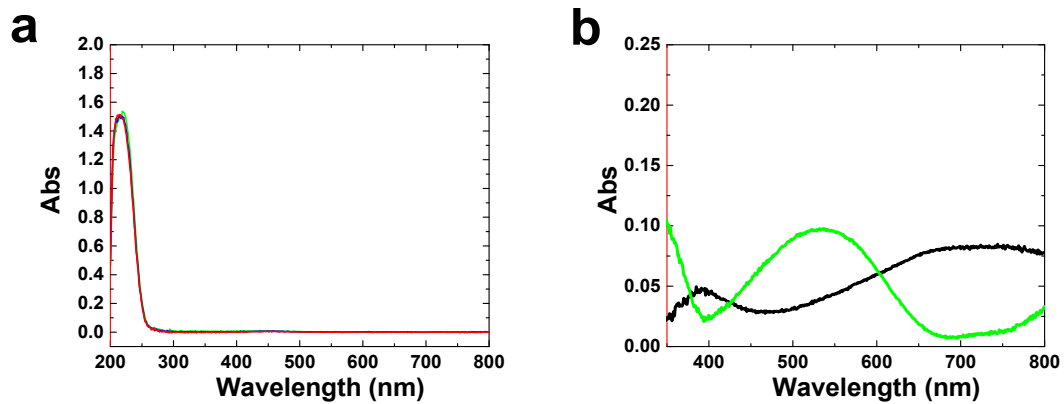


Figure S4 UV-Vis spectra for **1** after 10 minutes (green), 24 hours (blue) and one week (red) (a).

Visible spectra for NiOOH (black) and NiO (green) (b).

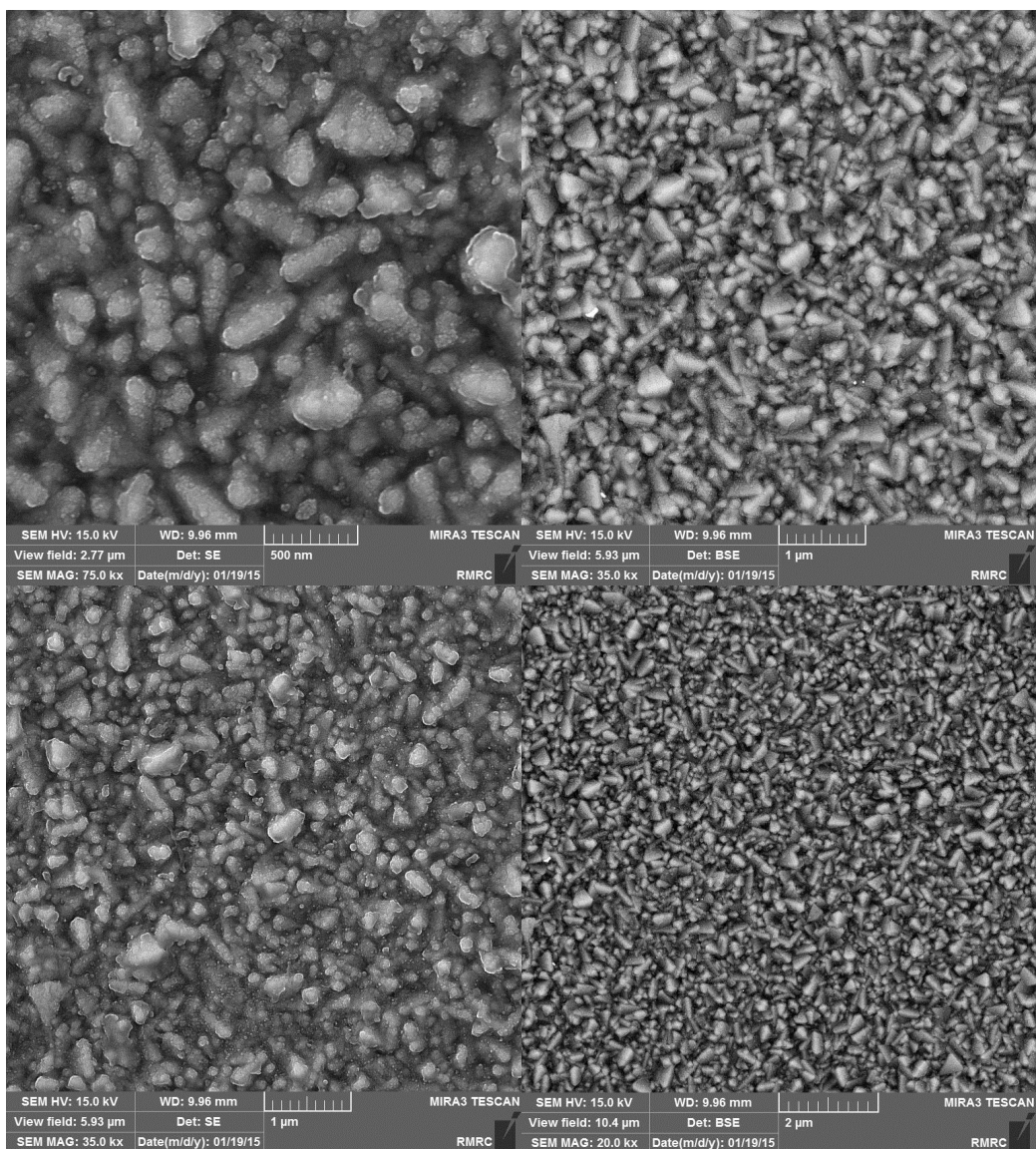


Figure S5 SEM images from fresh FTO.

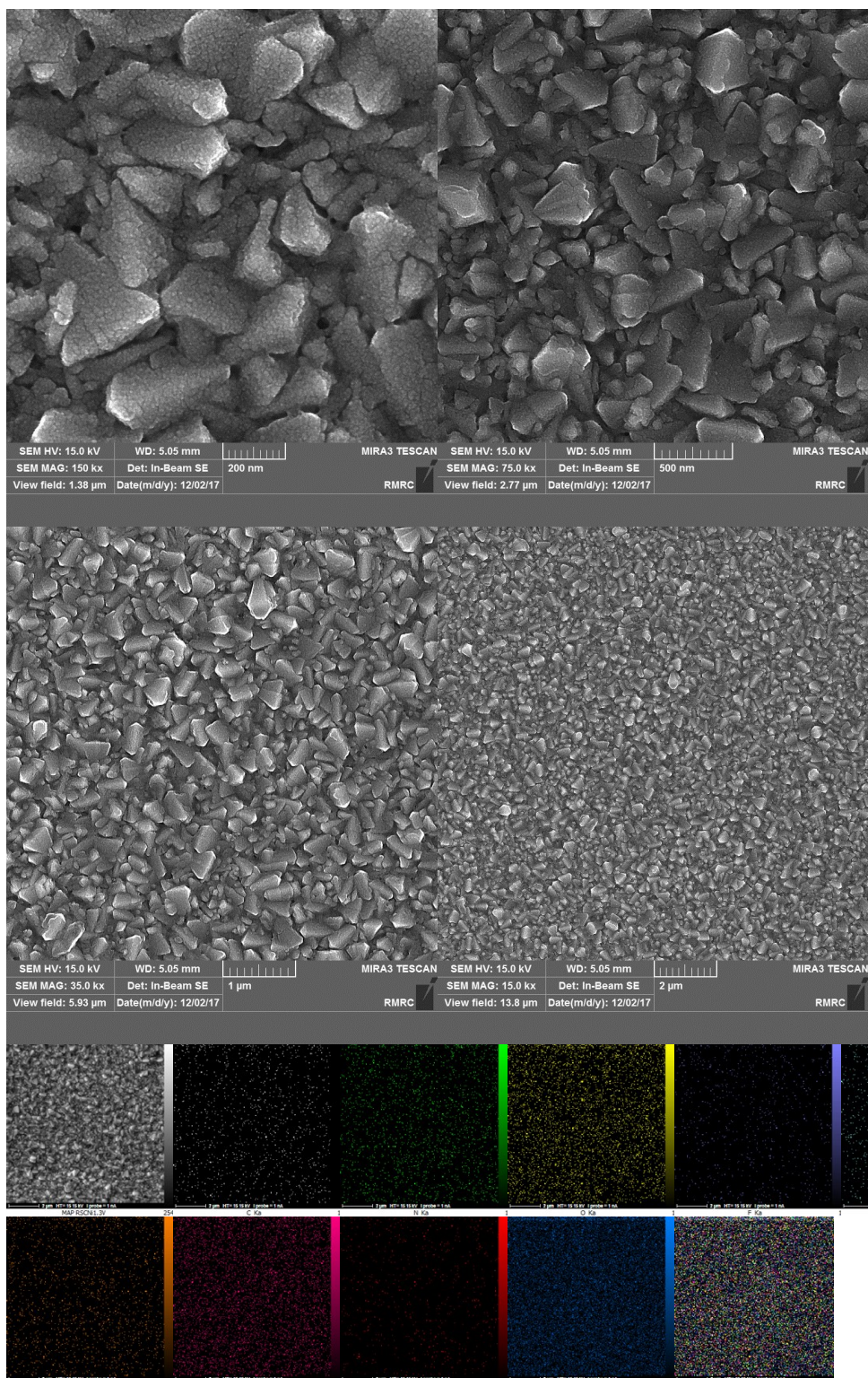


Figure S6 SEM and EDX-mapping for **1** (1.0 mM) under amperometry condition after 10 hours. Amperometric condition: 1.3 V; solution compositions: NaHCO_3 (0.1 M) and NaClO_4 (0.2M) at pH = 7.0; (C: carbon; N: green; O: yellow; F: blue; Na: dark green; P: brown; K: pink; Co: red; Sn: blue).

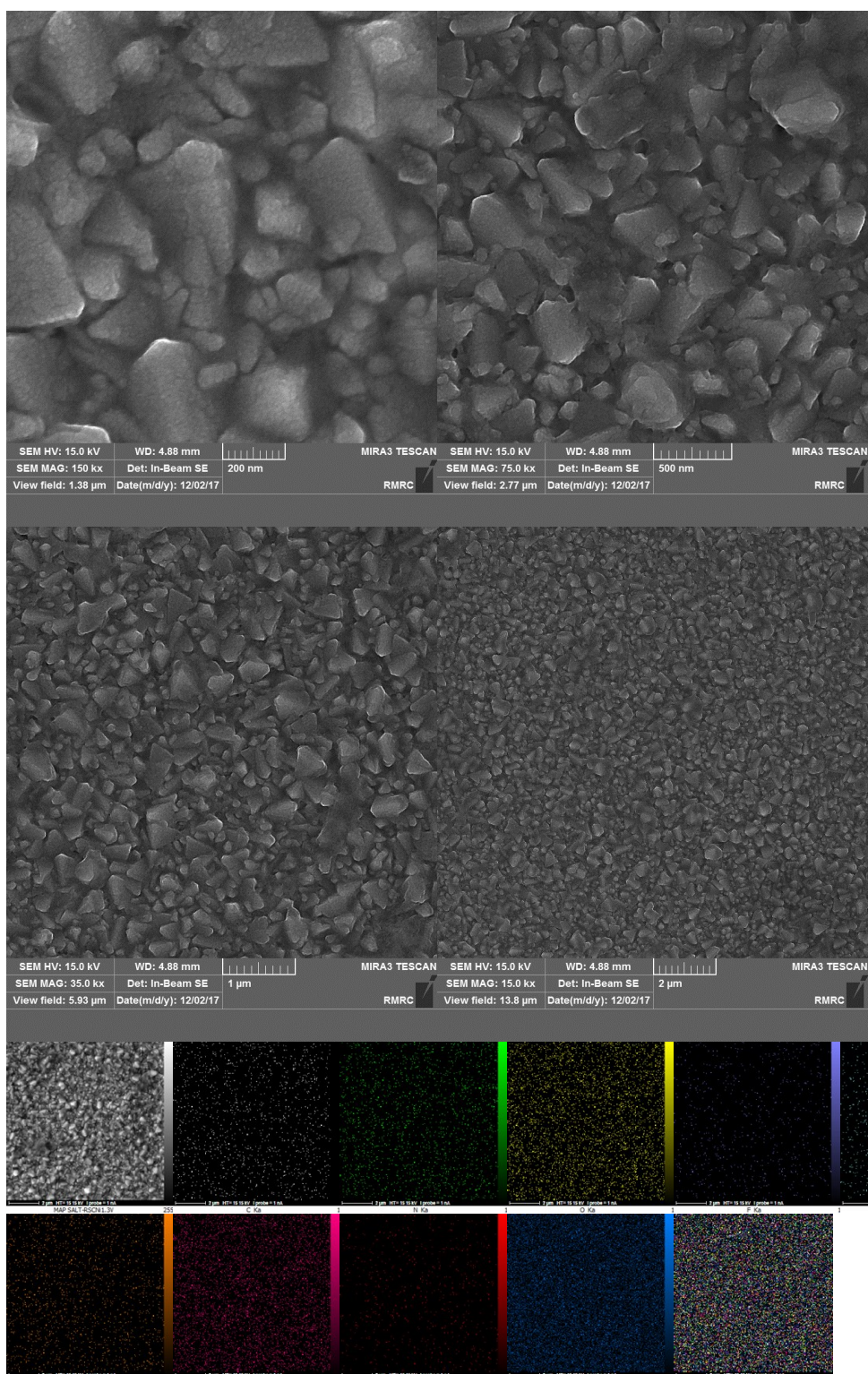


Figure S7 SEM and EDX-mapping for Ni salt (1.0 mM) under amperometry condition after 10 hours. Amperometric condition: 1.3 V; solution compositions: NaHCO_3 (0.1 M) and NaClO_4 (0.2M) at pH = 7.0; (C: carbon; N: green; O: yellow; F: blue; Na: dark green; P: brown; K: pink; Co: red; Sn: blue).

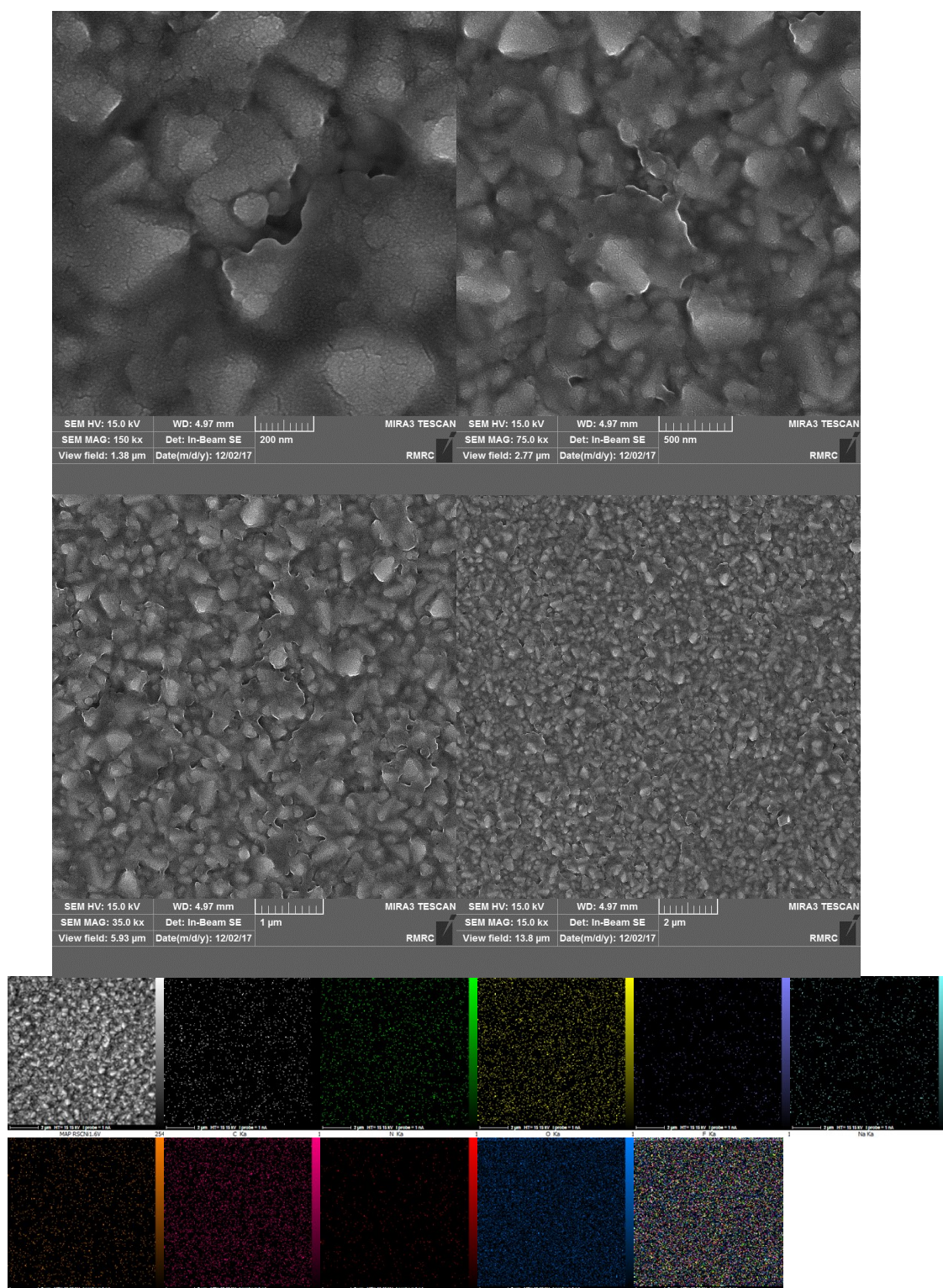


Figure S8 SEM and EDX-mapping for **1** (1.0 mM) under amperometry condition after 10 hours. Amperometric condition: 1.6 V; solution compositions: NaHCO_3 (0.1 M) and NaClO_4 (0.2M) at pH = 7.0; (C: carbon; N: green; O: yellow; F: blue; Na: dark green; P: brown; K: pink; Co: red; Sn: blue).

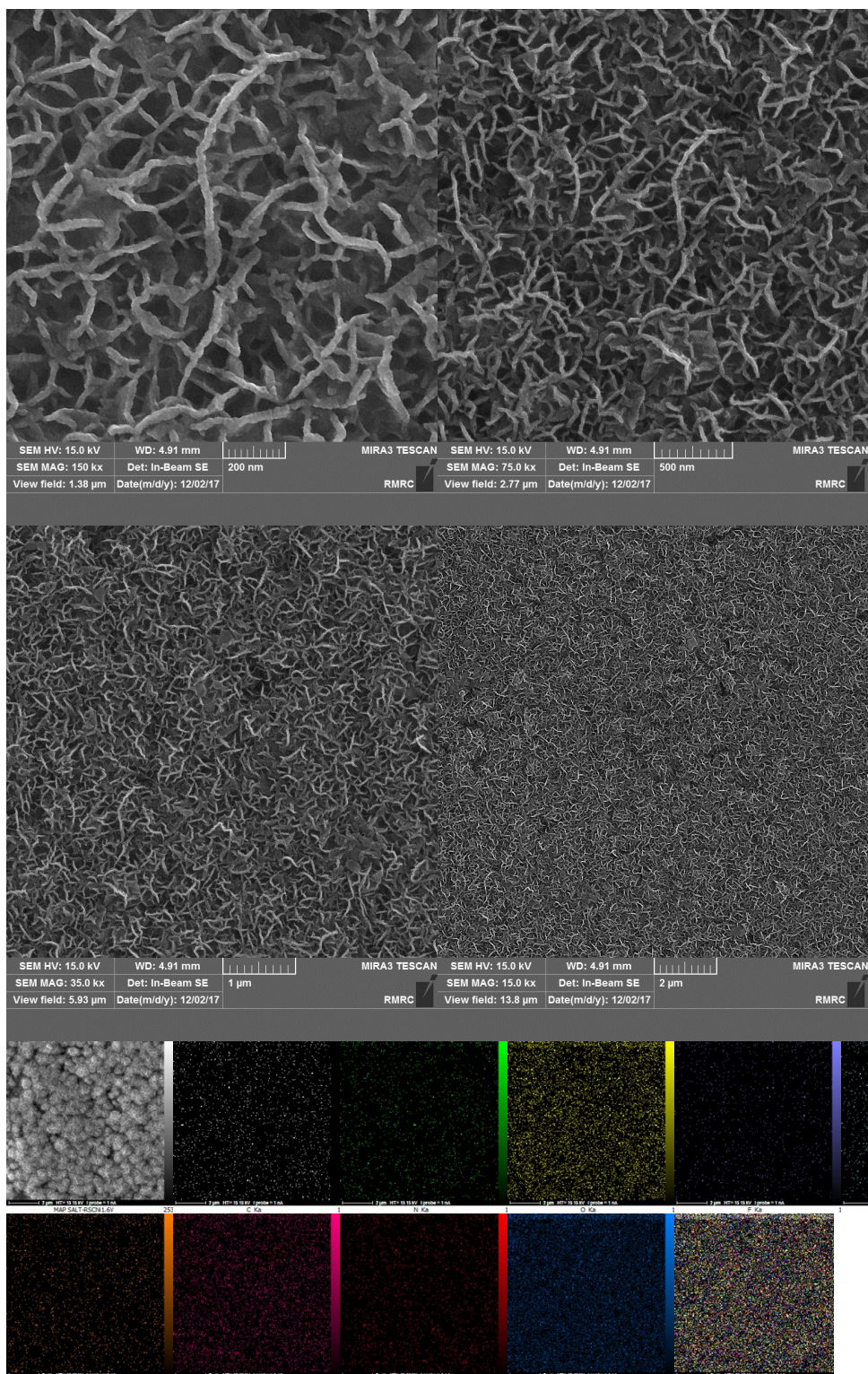


Figure S9 SEM and EDX-mapping for Ni salt (1.0 mM) under amperometry condition after 10 hours. Amperometric condition: 1.6 V; solution compositions: NaHCO_3 (0.1 M) and NaClO_4 (0.2M) at pH = 7.0; (C: carbon; N: green; O: yellow; F: blue; Na: dark green; P: brown; K: pink; Co: red; Sn: blue)

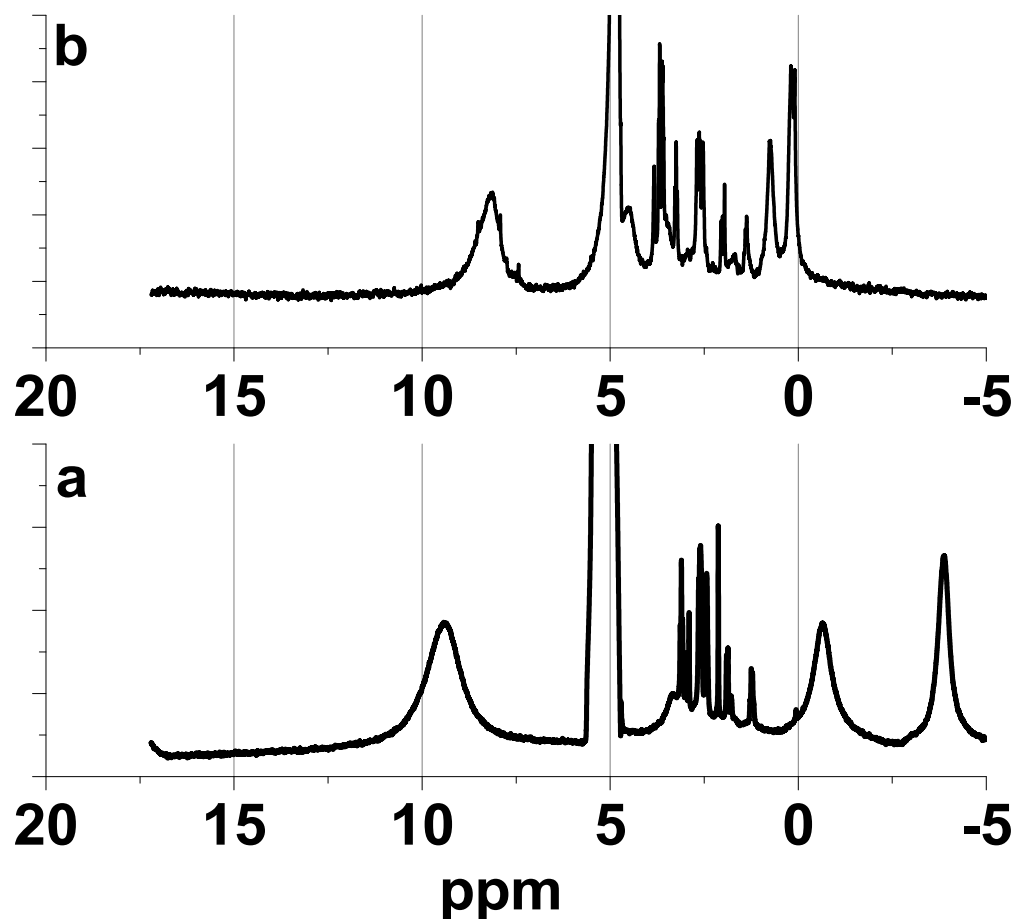


Figure S10 ^1H NMR spectra for **1** before (a) and after (b) the amperometry at 1.6 V.