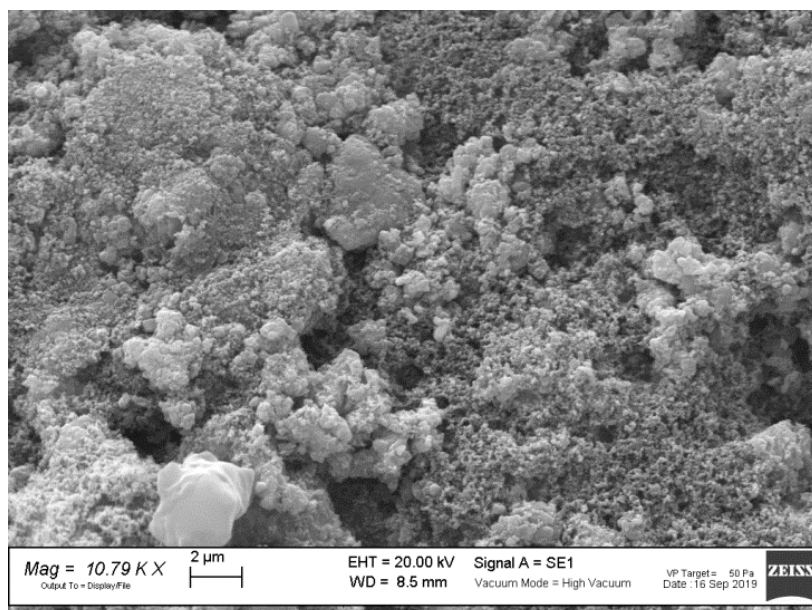
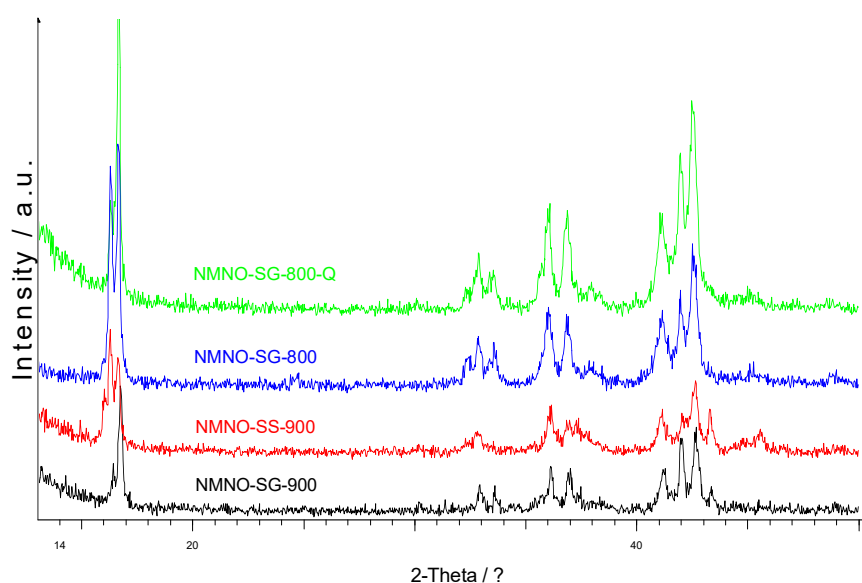


## Synergistic effect of polymorphs in doped $\text{NaNi}_{0.5}\text{Mn}_{0.5}\text{O}_2$ cathode material for improving electrochemical performances in Na-batteries

Francesco Leccardi, Davide Nodari, Daniele Spada, Marco Ambrosetti, Marcella Bini

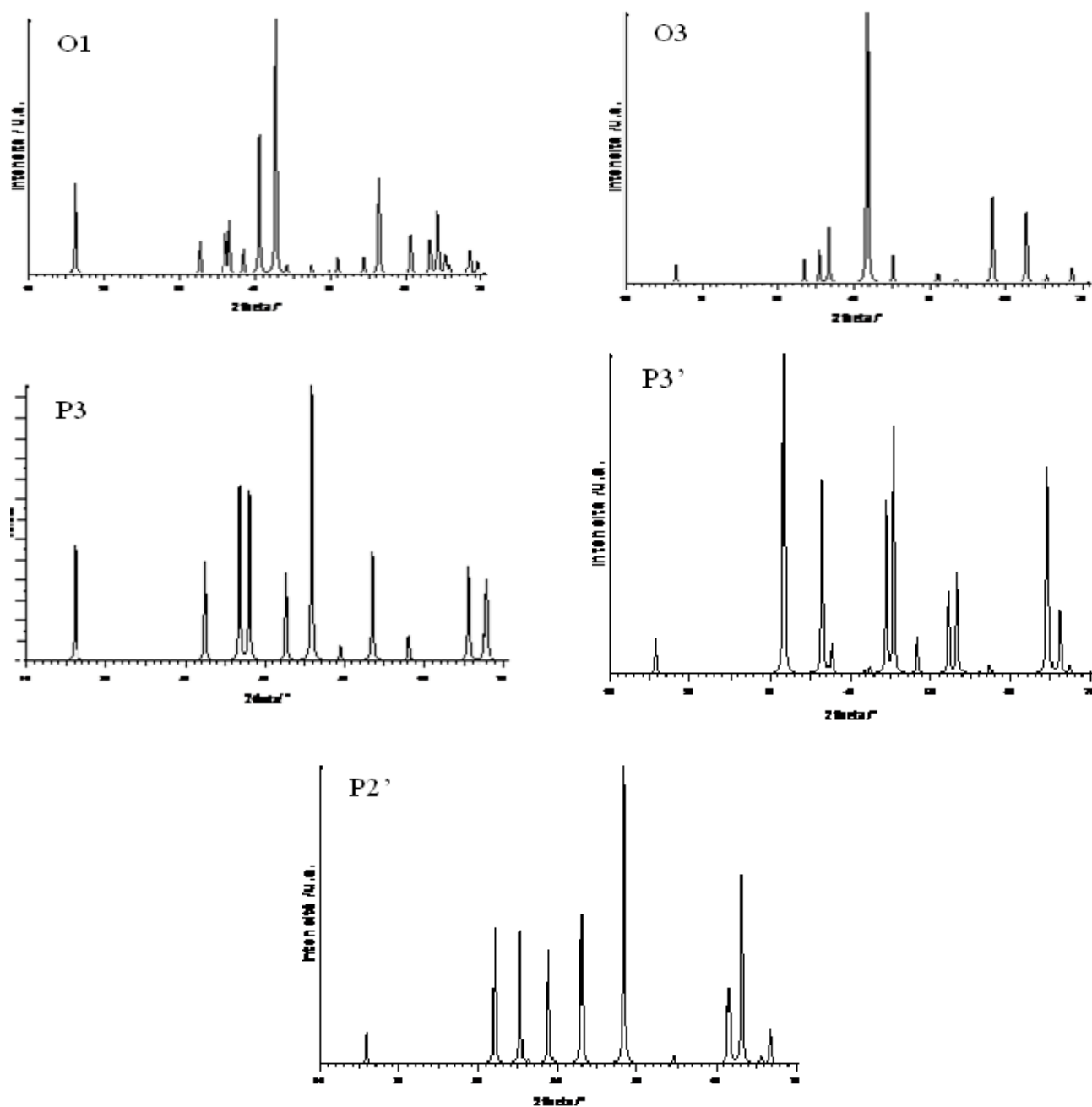


**Figure S1.** – SEM image of the slurry of NMNO-Cu sample.

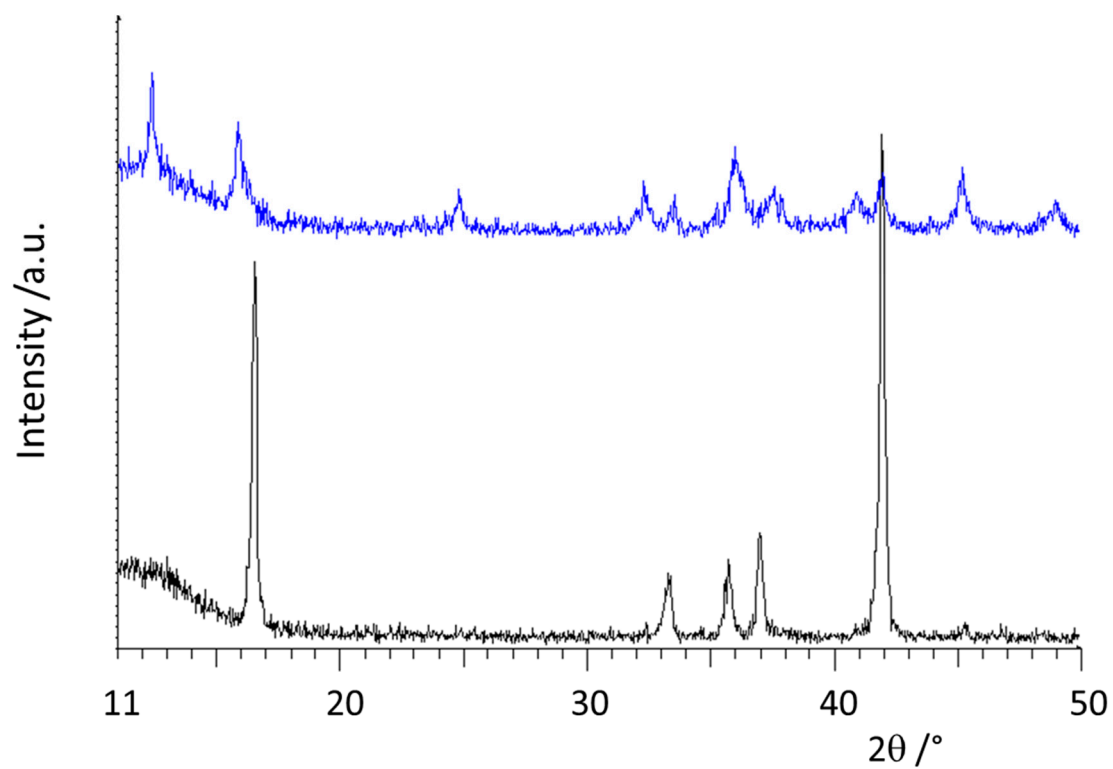


**Figure S2.** – Comparison between the NMNO patterns obtained in different experimental conditions.

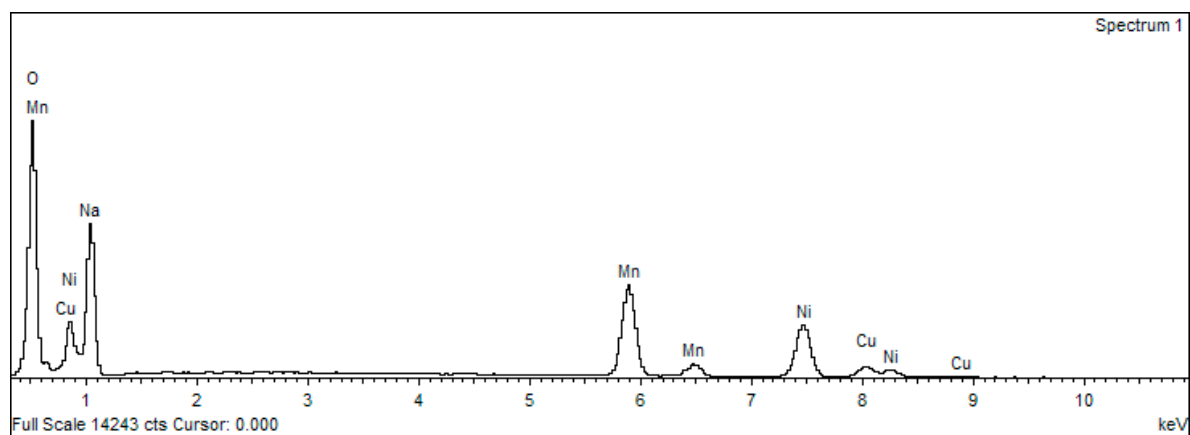
The samples followed by the acronym SG were prepared with the same synthesis method described in the experimental part of the paper, by only changing the thermal treatment. NMNO-SG-900 is the same reported in Fig. 1, NMNO-SG-800 is treated at a maximum temperature of 800 °C, NMNO-SG-800-Q was quenched from 800 °C to room temperature. NMNO-SS-900 was prepared by a solid state synthesis as described.  $\text{Na}_2\text{CO}_3$  (10 wt% excess), MnO and NiO were weighted in the proper amount and the resulting mixture was milled in a planetary ball-milling apparatus (Fritch Pulverisette) at 400 rpm for 1 h, with an intermediate rest for 15 min, with both jars and balls in tungsten carbide. The powder was pelletized and treated in oven in air at 900 °C for 12h (heating rate 5 °C/min, cooling rate 25 °C/min).



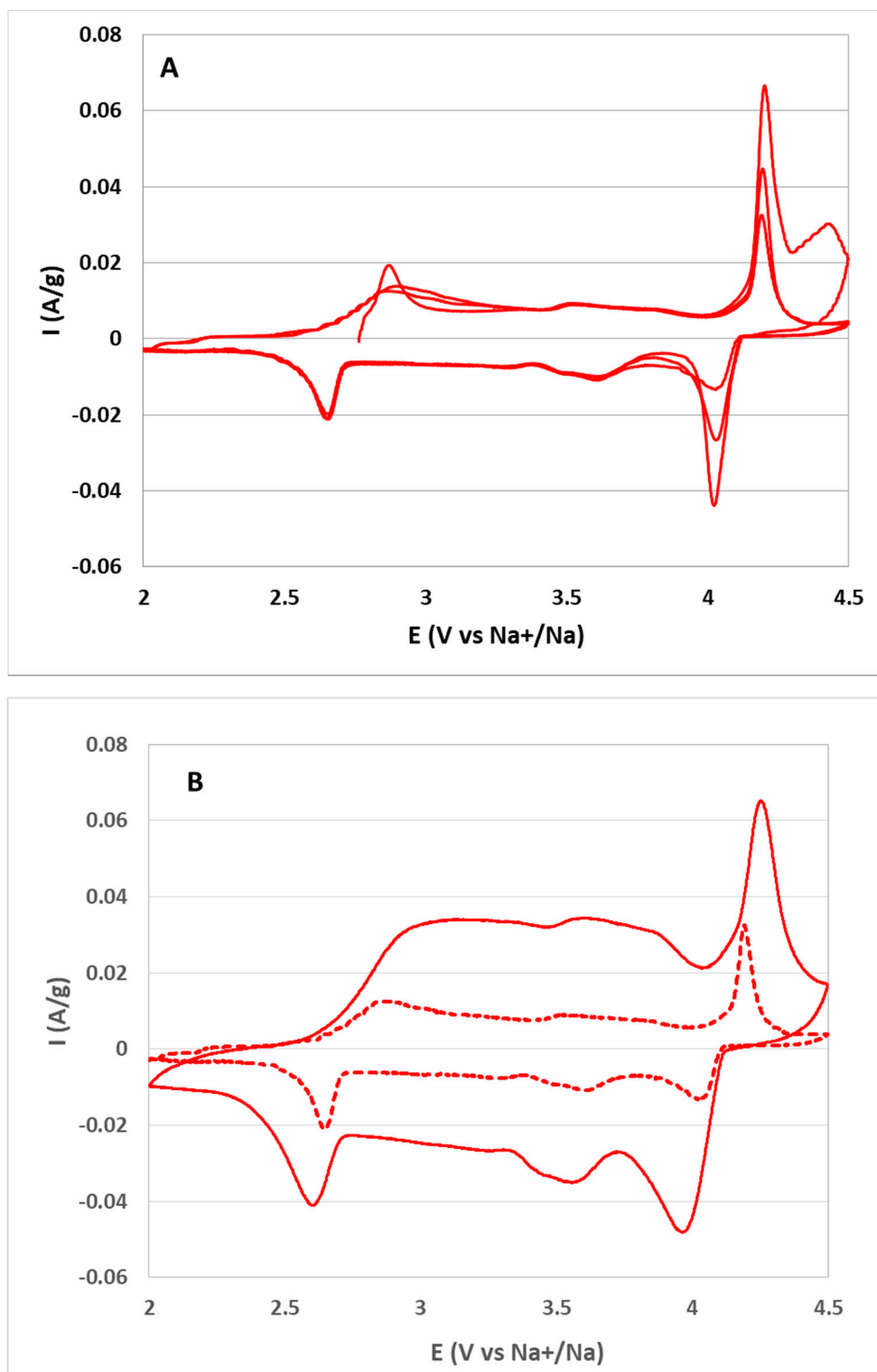
**Figure S3.** – Calculated patterns, starting from the models of the main O and P layered polymorphs, used to perform the Rietveld structural refinements described in the paper.



**Figure S4.** – XRPD patterns of NMNO-Ti before (black) and after (blue) air maintenance for some days.

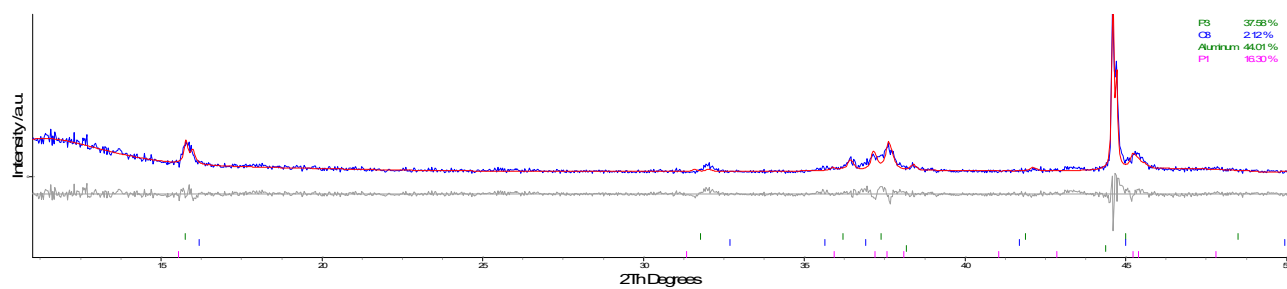


**Figure S5.** – EDS spectrum of NMNO-Cu doped sample.

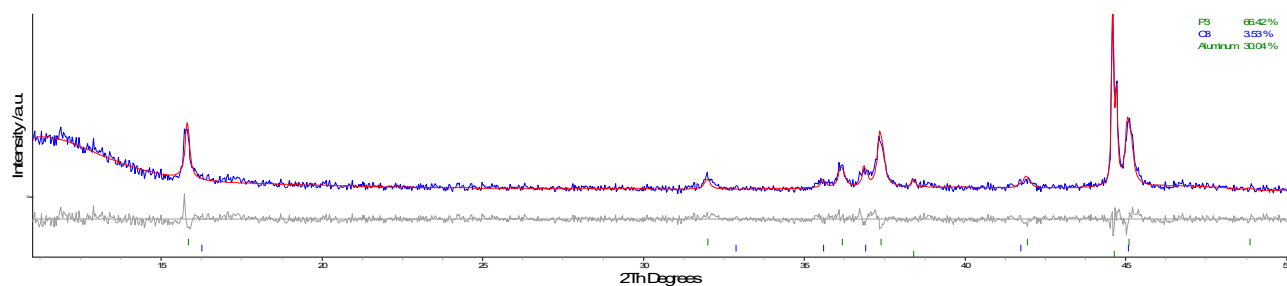


**Figure S6.** – (A) Three cycles of CV at 0.05 mVs<sup>-1</sup> and (B) comparison between the third cycle of the cyclic voltammetry at 0.01 mVs<sup>-1</sup> (continuous line) and 0.05 mVs<sup>-1</sup> (dotted line) for NMNO-Ti sample.

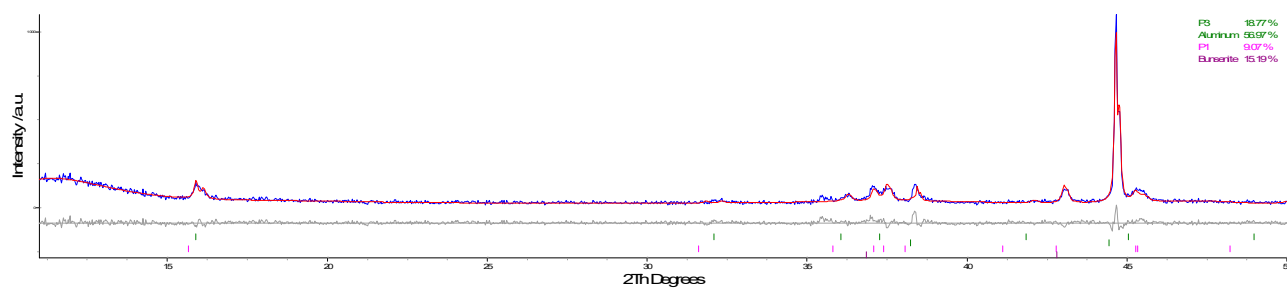
NMNO



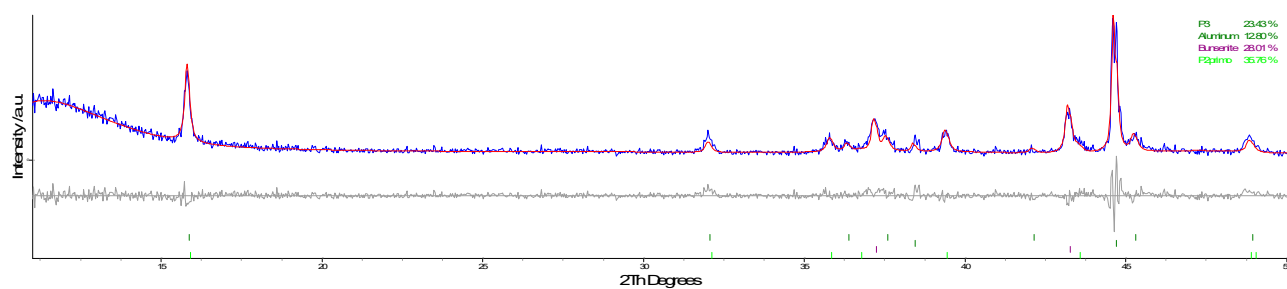
NMNO-Ti



NMNO-Cu



NMNO-V



**Figure S7.** – Rietveld refinements of *ex-situ* patterns collected post-mortem on the electrodes.