**Supporting Information for**

**Enhanced Electrochemical Performances of Ni-rich Cathode Materials for Lithium ion Batteries by Mixed Coating Layers**

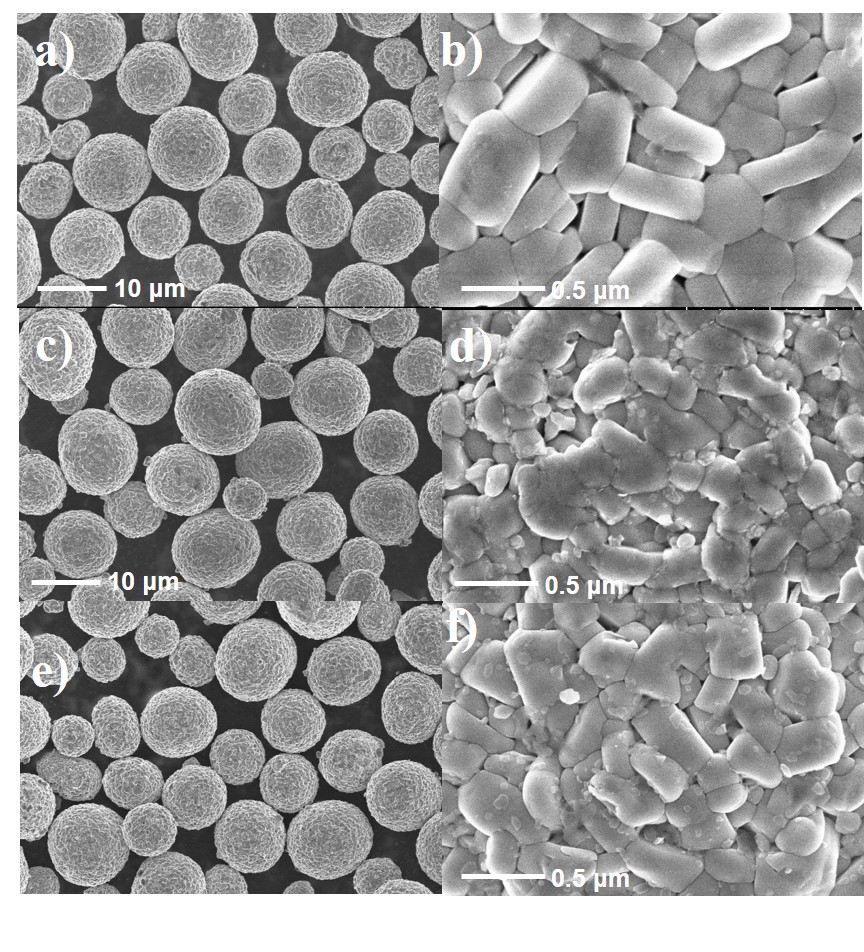
Zunzhi WANG, a,b,\*,† Shengxian SHE, a,b,\*,† Mengyao LV,b Xujun YUAN,b Hui SUN,b Jun ZHAO,b Jian YU, b and Xufeng YANb

a *School of Material Science and Engineering, Zhejiang University, Zheda Road No.38, Hangzhou, Zhejiang, 310000 China*

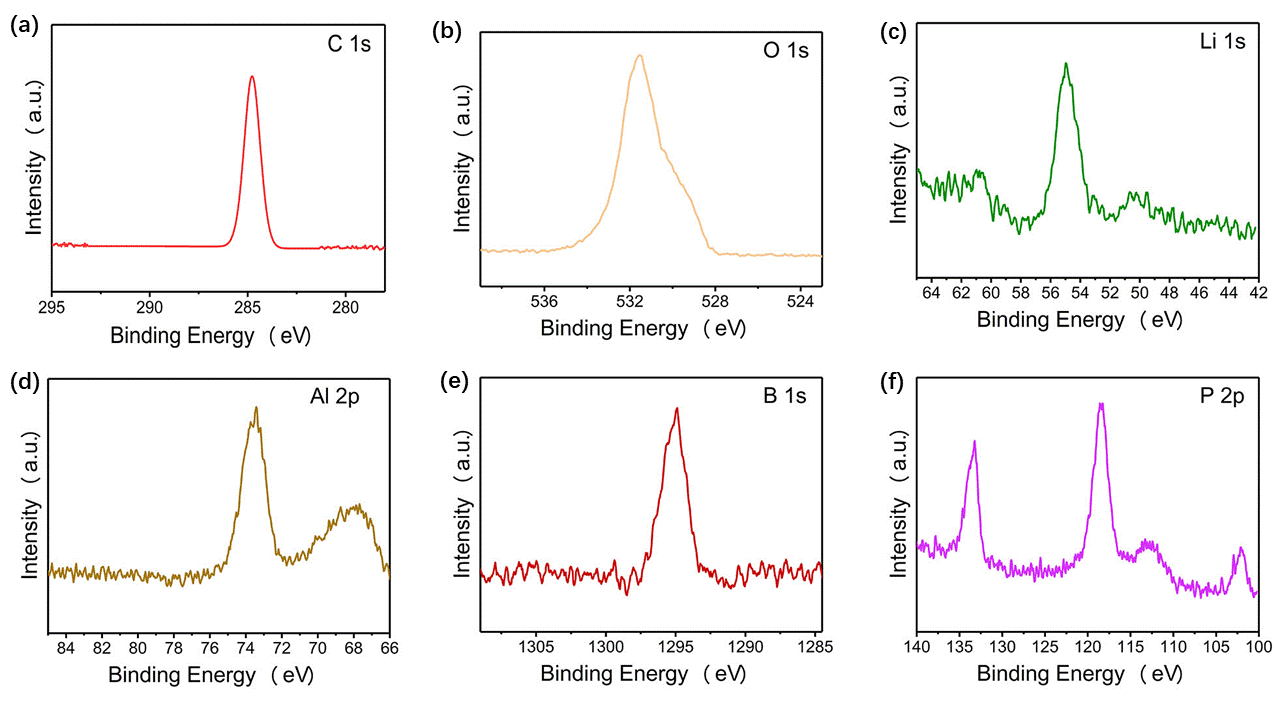
b *Ningbo Ronbay New Energy Technology Co., Ltd., Tanjialing East Road No.39 , Ningbo, Zhejiang, 315400 China*

**Corresponding author**: wzz@ronbaymat.com (Z. W.), ssx@ronbaymat.com (S. S.)

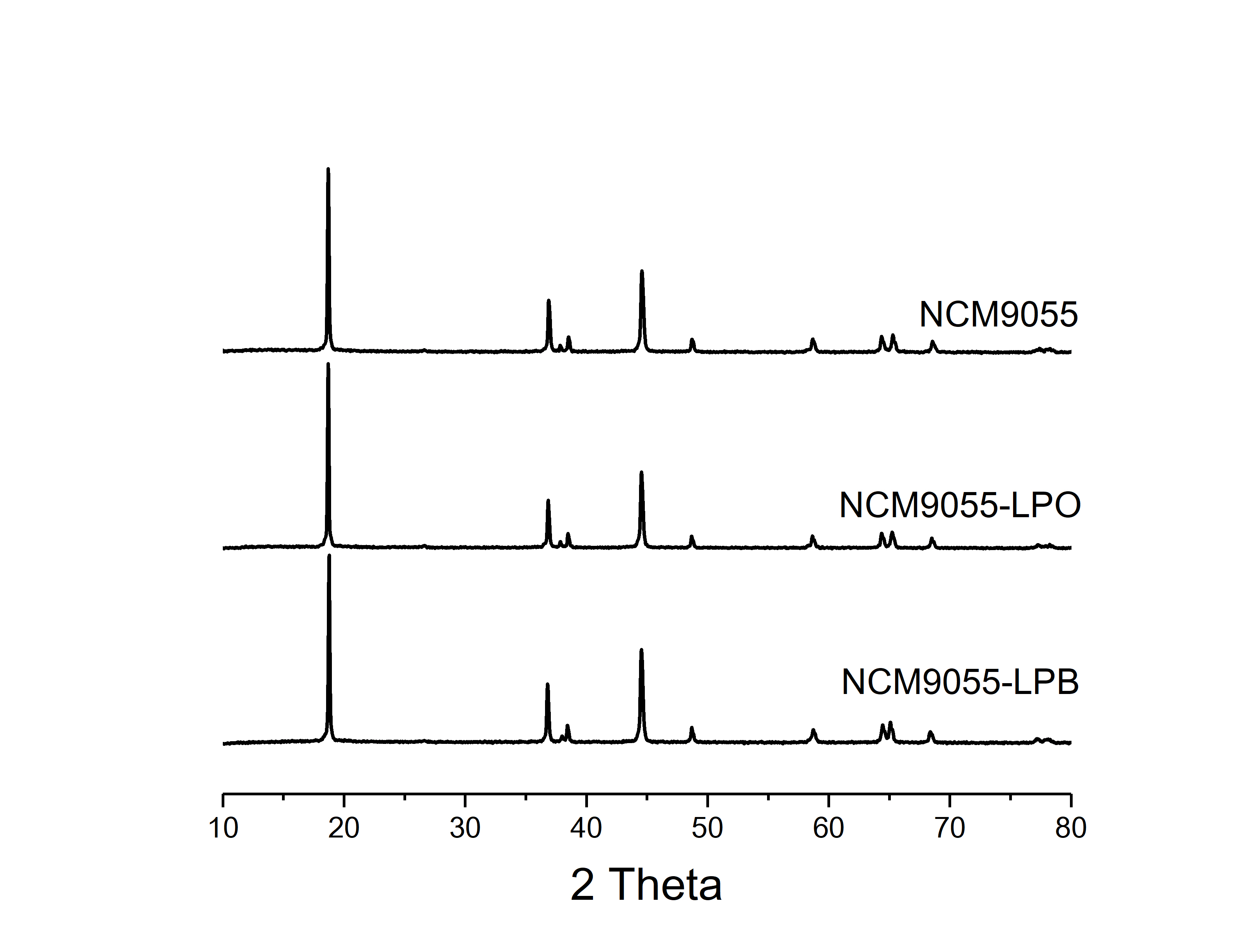
†These authors contributed equally to this work.

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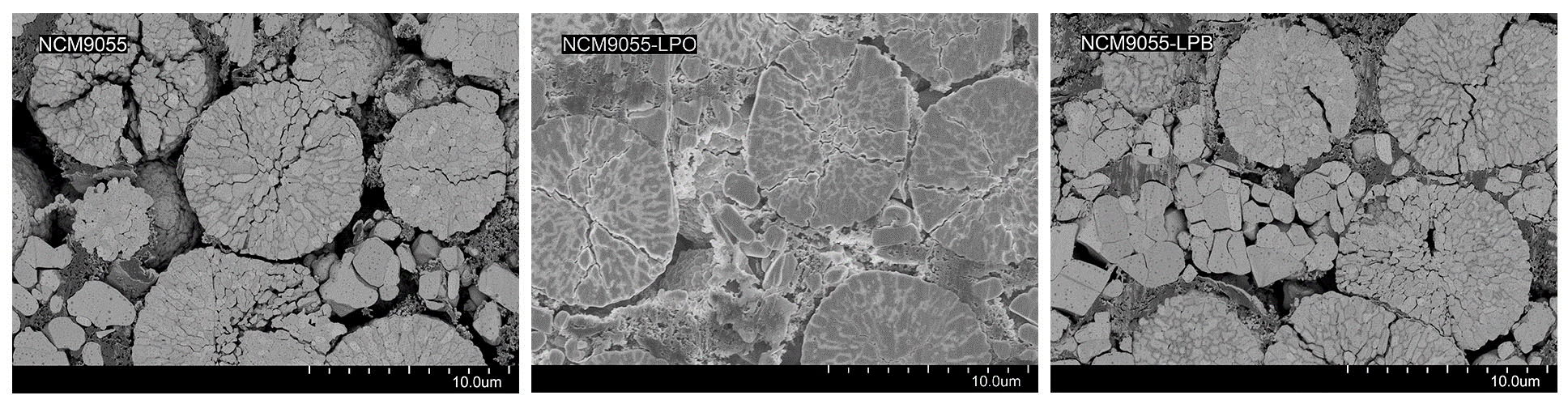
**Figure S1.** The SEM images of a), b) NCM9055; c), d) NCM9055-LPO; e), f)



**Figure S2.** The XPS spectra of a) C 1s, b) O 1s, c) Li 1s, d) Al 2p, e) B 1a, and f) P 2p.



**Figure S3.** The XRD of cycled NCM9055, NCM9055-LPO, and NCM9055-LPB.



**Figure S4.** The SEM of cycled NCM9055, NCM9055-LPO, and NCM9055-LPB.

**Table S1.** The physical and chemical properties of NCM9055, NCM9055-LPO, and NCM9055-LPB.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Samples** | **Items** | **Unit** | **NCM9055** | **NCM9055-LPO** | **NCM9055-LPB** |
| Physical &Chemical Properties | Li | wt % | 7.23 | 7.24 | 7.22 |
| Ni | wt % | 90.27 | 90.30 | 90.31 |
| Co | wt % | 5.03 | 4.98 | 4.79 |
| Mn | wt % | 4.70 | 4.72 | 4.90 |
| Li2CO3 | wt % | 1.1035 | 0.1082 | 0.2444 |
| LiOH | wt % | 0.5592 | 0.2432 | 0.2550 |
| BET | m2/g | 0.2991 | 1.1127 | 0.3846 |
| pH |  | 12.07 | 11.38 | 11.20 |
| *D*min | μm | 4.78 | 4.80 | 4.78 |
| *D*max | μm | 21.67 | 21.65 | 21.65 |
| *D*50 | μm | 10.38 | 10.42 | 10.21 |
| (*D*90-*D*10)/*D*50 | - | 0.67 | 0.67 | 0.67 |
| Coin cell  (4.25~2.5V) | 0.2C-rate Charge | mAh/g | 230.6 | 230.3 | 235.6 |
| 0.2C-rate Dis. | mAh/g | 200.9 | 206.9 | 213.4 |
| Eff. | % | 87.1 | 89.8 | 90.6 |