Supplementary Material

**Metal (M = Ru, Pd and Co) Embedded in C\textsubscript{2}N with Enhanced Lithium Storage Properties**

*Chunmao Huang,\textsuperscript{a,e,§} Javeed Mahmood,\textsuperscript{b,§} Zengxi Wei,\textsuperscript{c} Dan Wang,\textsuperscript{d} Shenghong Liu,\textsuperscript{a,e} Yanming Zhao,\textsuperscript{e} Hyuk-Jun Noh,\textsuperscript{b} Jianmin Ma,\textsuperscript{c} Jiantie Xu,\textsuperscript{a,*} and Jong-Beom Baek,\textsuperscript{b,*}*

\textsuperscript{a}Guangdong Provincial Key Laboratory of Atmospheric Environment and Pollution Control, National Engineering Laboratory for VOCs Pollution Control Technology and Equipment, School of Environment and Energy, South China University of Technology, Guangzhou 510640, China.

\textsuperscript{b}School of Energy and Chemical Engineering/Center for Dimension-Controllable Organic Frameworks, Ulsan National Institute of Science and Technology (UNIST), 50 UNIST, Ulsan 44919, South Korea.

\textsuperscript{c}School of Physics and Electronics, Hunan University, Changsha 410082, China.

\textsuperscript{d}State Key Laboratory of Organic-Inorganic Composites, Beijing University of Chemical Technology, Beijing 100029, China.

\textsuperscript{e}School of Physics, South China University of Technology, Guangzhou 510640, China.

*To whom correspondence should be addressed. E-mail: jbbaek@unist.ac.kr, jiantiexu@scut.edu.cn, Tel: +82-52-217-2510; Fax: +82-52-217-2639

§ These authors contributed equally.

**KEYWORDS:** Polyaniline; Holey nanocarbon; Metal incorporation; Anodes; Lithium ion batteries.
Fig. S1. Scheme of synthesis of C$_2$N.
Fig. S2. TGA analysis of C₂N annealed under air and nitrogen atmosphere.
Fig. S3. SEM images of C\textsubscript{2}N before (a) and (c, d) after annealing. (b) TEM image of C\textsubscript{2}N before annealing. Insets: SAED and magnified area.
Fig. S4. Charge/discharge profiles of M@C₂N (M = Ru, Pd and Co) and C₂N at various C-rates from 0.1 to 10 C.
Fig. S5. (a-c) Discharge/charge profiles at various C-rates and (d-f) CV curves of M@C2N at 0.1 mV s⁻¹ for initial 5 cycles. Inset of Figure 4a: Capacity retention vs. C-rate.
Fig. S6. EIS of M@C$_2$N (M = Ru, Pd and Co) electrode measured at 5 C (a) before cycle and (b) after 200 cycles.
Table S1. The specific surface area, pore volume and average pore diameter of M@C$_2$N (M = Ru, Pd and Co) and C$_2$N.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Surface area m$^2$ g$^{-1}$</th>
<th>Total pore volume (P/P$_0$=1.0)</th>
<th>Average pore diameter (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ru@C$_2$N</td>
<td>312.9</td>
<td>0.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Pd@C$_2$N</td>
<td>452.2</td>
<td>0.9</td>
<td>8.1</td>
</tr>
<tr>
<td>Co@C$_2$N</td>
<td>402.9</td>
<td>0.3</td>
<td>3.3</td>
</tr>
<tr>
<td>C$_2$N</td>
<td>351.1</td>
<td>0.2</td>
<td>2.5</td>
</tr>
</tbody>
</table>