Electronic Supplementary Information

Gas Adsorption Capacity in an all Carbon Nanomaterial Composed of Carbon Nanohorns and Vertically Aligned Carbon Nanotubes

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Figure S1: Photograph of the plasma arc process under water used for the synthesis of CNHs
Figure S2: TEM image of CNHs revealing their conical tip
Figure S3: TEM image of opened VACNTs. The disordered carbons are a by-product of the etching process
Figure S4: TEM image of opened CNHs.
Figure S5: XPS high resolution C 1s spectrum comparison of as-prepared VACNTs and opened VACNTs
Figure S6: XPS high resolution C 1s spectrum comparison of CNHs and opened CNHs
Figure S7: (a, c) Nitrogen adsorption/desorption isotherms at 77K and (b, d) NLDFT pore size distribution for VACNTs, opened VACNTs, CNHs and opened CNHs.
Figure S8: BET fit for opened CNHs, 90CNH-10VACNT, 50CNH-50VACNT.
Figure S9: Comparison between experimentally obtained adsorption isotherm and calculated adsorption isotherm for 90CNH-10CNT composite
**CO₂ adsorption capacity at 1 bar and 35 °C**

Low pressure CO₂ adsorption experiments were performed on a Thermogravimetric analyzer. About 10 mg of the sample was taken in a crucible. In the typical experiment, the adsorbent was heated to 300°C and kept at 300°C for 2 hours under argon flow of (ml/min) to remove residual water. Later, the sample was cooled down to 35°C. At 35°C, the gas was switched to CO₂. The CO₂ adsorption capacity was determined from the observed increase in weight under CO₂ exposure about one hour. After one hour, the gas was switched back to Argon and the temperature raised to 300°C for the complete desorption of CO₂. High purity CO₂ gas (99.95%) was used for the experiment.

Figure S10: ((a), (b) and (c)) weight profile and temperature profile, (d) CO₂ adsorption capacity at 1 bar 35°C for opened CNHs, 90CNH-10VACNT and 80CNH-20VACNT.
Table S1: CO₂ adsorption capacity at 30 bar and 25 °C

<table>
<thead>
<tr>
<th>Sample</th>
<th>CO₂ adsorption capacity at 30 bar and 25 °C</th>
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</thead>
<tbody>
<tr>
<td>Opened CNHs</td>
<td>7.05</td>
</tr>
<tr>
<td>90CNH-10VACNT</td>
<td>7.62</td>
</tr>
<tr>
<td>50CNH-50VACNT</td>
<td>8.71</td>
</tr>
</tbody>
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Figure S11: Virial fit based on three adsorption isotherms at 35°C, 25°C and 15°C, maintaining $p_1=2$ and $p_2=1$. 
