Chemical affinity assisted H₂ isotope separation using Ca-rich onion-peel-derived nanoporous carbon composite

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Fig. S1. Pore size distribution of OPC-AC.

Fig. S2. Elemental analysis of (a) OPC and (b) OPC-AC, and SEM images (c) OPC and (d) OPC-AC.
Table S1 EDS Data of OPC and OPC-AC

<table>
<thead>
<tr>
<th>Sample</th>
<th>C [wt%]</th>
<th>O [wt%]</th>
<th>Ca [wt%]</th>
<th>Mg [wt%]</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPC</td>
<td>73.95</td>
<td>19.66</td>
<td>6.39</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>OPC-AC</td>
<td>52.16</td>
<td>30.25</td>
<td>17.24</td>
<td>0.34</td>
<td>100</td>
</tr>
</tbody>
</table>

Fig. S3. FT-IR of OPC-AC.

Fig. S4. Pure gas (a) H₂ and (b) D₂ thermal desorption spectra measured with heating rate of 3 K min⁻¹
Fig. S5. D$_2$/H$_2$ thermal desorption spectrum measured at 25 K with a heating rate of 3 K min$^{-1}$.

Fig. S6. Comparison of H$_2$ and D$_2$ desorbed amount when using pure gas and 1:1 mixture, respectively at various exposure temperatures: 25 K (black), 40 K (red), 60 K (blue), and pure H$_2$ and D$_2$ TDS (olive) for a comparison of gas uptake.

Note that one mixture measurement of TDS at a given T$_{exp}$ provides each hydrogen and deuterium signal individually. The hydrogen (Figure S6a) and deuterium (Figure S6b) signals are presented separately to show temperature dependence. All olive dot-curves in Figure S6 imply the pure gas TDS (loading at room temperature and then cooling below 20 K; Figure S4), in which all adsorption sites are assumed to be accessible for both isotopes.
Fig. S7. $S_{D_2/H_2}$ at 20 mbar and various exposure temperatures.

Fig. S8. $D_2/H_2$ thermal desorption spectrum measured at 60 K with a heating rate of 3 K min$^{-1}$.
Fig. S9. D₂/H₂ thermal desorption spectrum measured at different heating rates.