Supporting information:

From lamellar to hierarchical: Overcoming the diffusion barriers of sulfide intercalated layered double hydroxide for highly efficient water treatment

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**S 1. EDX mapping of h-NFL-S@nf and l-NFL-S@nf**

*Figure S1.* EDX mapping of a) hierarchical NFL-S and b) lamellar NFL-S, and the homogeneously distribution of Ni, Fe, Mo and S on the substrate of Ni foam.
S 2. Adsorption kinetic parameters

Figure S2. Intra-particle diffusion model (Weber-Morris) of Pb²⁺ under different velocity of fluid flow.
**Table S1.** Kinetic parameters of Pb(II) adsorption on h-NFL-S@nf under different velocity of fluid flow.

<table>
<thead>
<tr>
<th>Velocity (mL/min)</th>
<th>pesudo-second-order</th>
<th>pseudo-first-order</th>
<th>intra-particle diffusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$q_{e,exp}$</td>
<td>$k_2$</td>
<td>$q_{e,cal}$</td>
</tr>
<tr>
<td>20</td>
<td>91.83</td>
<td>0.0002</td>
<td>104.94</td>
</tr>
<tr>
<td>50</td>
<td>97.46</td>
<td>0.0003</td>
<td>107.52</td>
</tr>
<tr>
<td>70</td>
<td>97.48</td>
<td>0.0004</td>
<td>106.38</td>
</tr>
</tbody>
</table>
S3. XPS S 2p and O 1s spectra of the NFL-S before and after heavy metal adsorption

Figure S3. XPS a) S 2p and b) O 1s spectra of the NFL-S before and after heavy metal adsorption (Pb$^{2+}$ and Cu$^{2+}$).
S4. Reusability study

Figure S4. Pb(II) removal efficiency and recycling of h-NFL-S@nf. The initial concentration of Pb(II) is 10 mg L$^{-1}$. 