Figure S1. Calcium alginate beads, either pure (CaAlg, right) or containing Ca-Al LDH (CaAlg/HC, left).
Figure S2. pH vs. $t$ curves (below) and proton uptake ($I_{\text{H}}$) kinetics (above) for HC placed in 100 mL solutions of increasing [HCl]. One out of 20 points are represented in the curves.
Table S1. Fitting constants of proton uptake kinetics according to the zero order model.

<table>
<thead>
<tr>
<th>[HCl]a</th>
<th>( \Gamma_{H,150}^b )</th>
<th>( \Gamma_{H,0}^b )</th>
<th>( k_2^d )</th>
<th>( R^2 )</th>
<th>( \Gamma_{H,150}^b )</th>
<th>( \Gamma_{H,0}^b )</th>
<th>( k_2^d )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.5</td>
<td>0.055</td>
<td>0.020</td>
<td>0.972</td>
<td>0.5</td>
<td>0.038</td>
<td>0.092</td>
<td>0.985</td>
</tr>
<tr>
<td>0.2</td>
<td>1.6</td>
<td>0.204</td>
<td>0.041</td>
<td>0.968</td>
<td>1.6</td>
<td>0.193</td>
<td>0.034</td>
<td>0.975</td>
</tr>
<tr>
<td>0.5</td>
<td>3.2</td>
<td>0.463</td>
<td>0.068</td>
<td>0.955</td>
<td>3.9</td>
<td>0.606</td>
<td>0.046</td>
<td>0.955</td>
</tr>
<tr>
<td>1.0</td>
<td>4.8</td>
<td>0.685</td>
<td>0.100</td>
<td>0.970</td>
<td>5.6</td>
<td>0.859</td>
<td>0.080</td>
<td>0.960</td>
</tr>
</tbody>
</table>

\( a \text{ mmol L}^{-1}; \ b \text{ µmol bead}^{-1}; \ c \text{ min}; \ d \text{ µmol min}^{-1} \text{ bead}^{-1} \)