Supplementary Information

Electrochemical Nanoimprint Lithography: When Nanoimprint Lithography Meets Metal Assisted Chemical Etching

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1. The fermi level alignment on Pt/n-GaAs/electrolyte 3-phase interface

**Figure S1.** The fermi level alignment on Pt/n-GaAs/electrolyte 3-phase interface.
2. One-step ECNL of various kinds of simple 2.5D-MNS

![Image](https://example.com/image.png)

**Figure S2.** The mold (a) with lots of different 2.5D-MNS were imprinted onto n-GaAs (b) with larger area by one-step ECNL for only 20 min. Zone A, B and C on mold were transferred onto n-GaAs with corresponding A’, B’ and C’.
3. XPS analysis of the residual oxides and platinum on GaAs

![XPS spectra of n-GaAs surface](image.png)

**Figure S3.** The X-ray photoelectron spectra of n-GaAs surface. (a) XPS spectra of As 3d on n-GaAs before ECNL. (b) XPS spectra of As 3d on n-GaAs after ECNL. (c) XPS spectra of Pt 4f on n-GaAs after ECNL.

**Table S1** The atomic concentration of the elements on n-GaAs after ECNL

<table>
<thead>
<tr>
<th>Sample</th>
<th>O1s (%)</th>
<th>Ga2p3 (%)</th>
<th>As3d (%)</th>
<th>Pt4f (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>54.23</td>
<td>26.05</td>
<td>19.43</td>
<td>0.29</td>
</tr>
<tr>
<td>2</td>
<td>54.99</td>
<td>25.08</td>
<td>19.81</td>
<td>0.12</td>
</tr>
<tr>
<td>3</td>
<td>63.69</td>
<td>16.79</td>
<td>19.32</td>
<td>0.20</td>
</tr>
<tr>
<td>4</td>
<td>57.95</td>
<td>22.93</td>
<td>18.63</td>
<td>0.49</td>
</tr>
<tr>
<td>5</td>
<td>54.29</td>
<td>25.25</td>
<td>20.11</td>
<td>0.35</td>
</tr>
<tr>
<td>Average value</td>
<td>57.03</td>
<td>23.22</td>
<td>19.46</td>
<td>0.29</td>
</tr>
</tbody>
</table>
4. Optimizing the contact pressure of ECNL

**Figure S4.** The non-uniform concave microlens fabricated under non-uniform contact pressure. The contact pressure is kept at 0.5 atm.

**Figure S5.** The concave microlens with humps (a) and wrinkles (b) fabricated under an excessive contact pressure. The contact pressure is kept at 1 atm (a) and 2 atm (b).

**Figure S6.** The confocal laser microscopy images of concave microlens with humps in the bottom when the contact pressure is kept at 1 atm.
5. Optimizing the temperature of ECNL

Figure S7. The precipitate of MnO$_2$ deposited on the surface of mold after ECNL for 40 min when 0.1 mol/L KMnO$_4$ and 40 °C temperature was used.
6. The electrolytic cell used in ECNL

Figure S8. The schematic illustration on the electrolytic cell of ECNL.