Supporting Information

Optically Tunable Chiral Nematic Mesoporous Cellulose Films

Maik Schlesinger, Wadood Y. Hamad and Mark J. MacLachlan*

**Figure S1.** UV/Vis spectra of time-dependent treatment of CNC/Si-1 (black, dashed) with a 4.2 wt% aqueous lithium hydroxide solution (black: 15 min; red: 30 min; green: 1 h; blue: 2 h; magenta: 48 h) and hydrofluoric acid (cyan: 15 min).
Figure S2. TGA curves (air, 10 °C min⁻¹) of CNC/Si-1 (black, dashed) after treatment with a 4.2 wt% aqueous lithium hydroxide solution (red: 30 min; blue: 2 h; magenta: 48 h) and hydrofluoric acid (cyan: 15 min).
Figure S3. a) IR spectra of CNC/Si-1 (black), CNC/Si-1(48h) (magenta) and CNC/Si-1-HF (cyan); b) EDX spectrum of CNC/Si-1(48h); c) EDX spectrum of CNC/Si-1-HF.
Figure S4. UV/Vis spectra of CNC/Si after treatment with 1.825 M aqueous solutions of lithium hydroxide (solid line, UV/Vis reflection band: 498 nm), sodium hydroxide (dashed line, UV/Vis reflection band: 502 nm) and potassium hydroxide (dotted line, UV/Vis reflection band: 528 nm) for 48 h.

Figure S5. PXRD patterns of CNC (black), CNC/Si-1 (red) and cellulose Iβ (calculated from CCDC 810597).
Figure S6. $N_2$ adsorption isotherms of CNC/Si-1(48h) (left) and CNC/Si-1-HF (right) after drying under ambient conditions.

Figure S7. UV/Vis spectrum (left), SEM image (middle) and photograph (right) of CNC/Si-1(48h) after sc-CO$_2$ drying.

Figure S8. UV/Vis spectra (left) of CNC/Si-2 (dashed line) and CNC/Si-2(48h) (solid line); CD spectra (middle) and SEM image (right) of CNC/Si-2(48h).
Figure S9. N\textsubscript{2} adsorption isotherm and BJH pore-size distribution (inset) of \textit{CNC/Si-2(48h)} after sc-CO\textsubscript{2} drying.

Figure S10. UV/Vis spectra of \textit{CNC/Si-PS} (left, green line), \textit{CNC/Si-CA} (left, red line), \textit{CNC/Si-Al} (left, black line), \textit{CNMC-PS} (right, green line), \textit{CNMC-CA} (right, red line) and \textit{CNMC-Al} (right, black line).
Figure S11. SEM images of **CNMC-PS** (left), **CNMC-CA** (middle) and **CNMC-Al** (right).

Figure S12. **N₂** adsorption isotherm and BJH pore-size distribution (inset) of **CNMC-PS** (left), **CNMC-CA** (middle) and **CNMC-Al** (right).
Figure S13. UV/Vis spectra (left) of dry CNC/Si-2(48h) (solid line) and after soaking in ethanol (dashed line) or water (dotted line). Photographs (right) of CNC/Si-2(48h) after soaking in water.

Figure S14. Photographs of unloaded CMNC (a), CNMC-Au-5 (b), CNMC-Au-10 (c) and CNMC-Au-100 (d).
Figure S15. Thermogravimetric analyses of CNMC-Au-5 (black line), CNMC-Au-10 (red line) and CNMC-Au-100 (green line).

Figure S16. N₂ adsorption isotherms and BJH pore-size distributions (inset) of CNMC-Au-5 (left), CNMC-Au-10 (middle) and CNMC-Au-100 (right) after sc-CO₂ drying.
Figure S17. SEM images of CNMC-Au-5 (left), CNMC-Au-10 (middle) and CNMC-Au-100 (right).

Figure S18. Particle size distribution for CNMC-Au-10. The mean particle size determined from counting 93 nanoparticles is 25.3 ± 0.8 nm.
Figure S19. Powder X-ray diffraction patterns (black lines) of CNMC-Au-5 (left), CNMC-Au-10 (middle) and CNMC-Au-100 (right). The diffraction patterns are resolved between 10° - 37° 2θ into crystalline peaks and amorphous background (red lines; this region was used as there is no interference with the diffraction peaks of Au NPs (green; PDF 03-065-2870)). The refinement was done using the Ruland-Rietveld analytical approach of the crystal structure of cellulose Iβ (CCDC 810597; magenta). The degree of crystallinity was determined to be ~86% (MPC-Au-5), ~80% (MPC-Au-10) and ~84% (MPC-Au-100).
Figure S20. EDX spectra (a), EDX mapping combined with SEM image (b) and EDX mapping for gold (c) of CNMC-Au-5 (top), CNMC-Au-10 (middle) and CNMC-Au-100 (bottom).
Figure S21. UV/Vis (left) and CD (right) spectra of gold loaded (100 mM) achiral nematic mesoporous cellulose.

Table S1. BET surface areas, pore volumes and BJH pore-size distributions of CNMC-Au-5, CNMC-Au-10 and CNMC-Au-100

<table>
<thead>
<tr>
<th>sample</th>
<th>BET-(A_o) (m(^2) g(^{-1}))</th>
<th>Pore volume (cm(^3) g(^{-1}))</th>
<th>BJH pore-width (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNMC-Au-5</td>
<td>284</td>
<td>1.13</td>
<td>14.0</td>
</tr>
<tr>
<td>CNMC-Au-10</td>
<td>279</td>
<td>0.96</td>
<td>12.3</td>
</tr>
<tr>
<td>CNMC-Au-100</td>
<td>281</td>
<td>1.09</td>
<td>13.2</td>
</tr>
</tbody>
</table>