Supplementary Material for:
Streams, cascades, and pools: Various water cluster motifs in structurally similar Ni(II) complexes

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Figure S1. $^1$H NMR of HL$^1$: (DMSO - D$_6$, 400 MHz) $\delta$ 2.05 (br, 2H), 2.63 (t, 2H), 3.28 (t, 2H), 3.98 (s, 3H), 6.82 (d, 1H), 6.88 (d, 1H), 8.14 (s, 1H). The small peak labeled x results from tautomerization of the amido proton (d). Addition of D$_2$O results in the loss of this peak.

Figure S2. $^1$H NMR of H$_2$L$^3$: (C$_6$D$_6$, 400 MHz) $\delta$ 1.35 (br, 1H), 2.3-2.7 (m, 6H), 3.2-3.5 (m, 3H), 3.68 (s, 3H), 6.32 (d, 1H), 6.92 (d, 1H), 8.08 (s, 1H). The small peak labeled x results from tautomerization of the amido proton (g). Addition of D$_2$O results in the loss of this peak.
Figure S3. $^1$H NMR of NiL$^3$ (2): (CD$_3$OD, 400 MHz) $\delta$ 1.18 (s, 1H), 2.16-3.45 (m, 8H), 3.78 (s, 3H), 6.29 (d, 1H), 6.92 (d, 1H).

Figure S4. $^1$H NMR of NiL$^4$ (4): (C$_3$D$_6$O, 400 MHz) $\delta$ 1.77 (s, 3H), 1.90 (s, 3H), 2.84 (t, 2H), 3.41 (t, 2H), 3.92 (s, 3H), 4.98 (s, 1H), 6.61 (d, 1H), 7.05 (d, 1H).
Figure S5. $^1$H NMR of NiL$^5$ (5): (CDCl$_3$, 400 MHz) $\delta$ 1.78 (s, 3H), 1.82 (s, 3H), 2.92 (t, 2H), 3.45 (t, 3H), 3.88 (s, 3H), 4.86 (s, 1H), 6.62 (d, 1H), 6.64 (d, 1H).

Figure S6. UV-Vis spectrum of NiL$^3$ (2) in CH$_3$CN.
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Figure S9. UV-Vis spectrum of NiL₅ (5) in CH₃CN.

Table S1. Selected stretches (cm⁻¹) in FT-IR spectra of HL¹ and 1-5

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<th>4</th>
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Figure S10. FT-IR spectrum of HL$^1$.

Figure S11. FT-IR spectrum of NiL$^2$ (1).
Figure S12. FT-IR spectrum of NiL³ (2).

Figure S13. FT-IR spectrum of Ni(L¹)₂ (3).
Figure S14. FT-IR spectrum of NiL$^4$ (4).

Figure S15. FT-IR spectrum of NiL$^5$ (5).
Figure S16. MALDI of NiL$_3$ (2).

Figure S17. MALDI of Ni(L$^1$)$_2$ (3).
Figure S18. MALDI of NiL$^4$ (4).

Figure S19. MALDI of NiL$^5$ (5).
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Figure S21. Unit cell diagram of Ni(L')$_2$ (3).
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Figure S23. Unit cell diagram of NiL$^5$ (5).
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Figure S26. TGA of NiL$^3$ (2).

Figure S27. DSC of NiL$^3$ (2).
Figure S28. TGA of NiL$^4$ (4).

Figure S29. DSC of NiL$^4$ (4).
Figure S30. TGA of NiL⁵ (5).

Figure S31. DSC of NiL⁵ (5).
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<table>
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<tr>
<th>Sample</th>
<th>DC Bias (V)</th>
<th>Circuit</th>
<th>Chi-Squared</th>
<th>Capacitance (F)</th>
<th>$Z'$ @ 100 kHz (Ω)</th>
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Figure S34. Nyquist representations of EIS data for 22 μF capacitor control (A), complexes 1 (B), 4 (C), and 5 (D). Data in B, C, and D were truncated at $-Z'' = 80,000 \, \Omega$ to illustrate similarities with (A) and omit the diffusion-related noise observed at low frequencies.