

Supporting Information (SI)

Coordinatively Unsaturated Structurally Diverse Homophthalate based Cobalt (II)

Coordination Polymers for Efficient Multicomponent Catalysis

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Materials and methods

All the solvents and reagents were purchased from commercial sources and used without further purification. The commercially obtained reagents mentioned above were used without further purification. The single crystal XRD diffraction data was collected using BRUKER AXS (D8 Quest System) X-ray diffractometer. Powder X-Ray diffraction patterns were recorded on PANalytical X'Pert Pro Diffractometer operated at 40 kV and 45 mA with Cu K α radiation. The surface area measurement analysis was performed by the Quantachrome autosorb iQ2 analyzer. Thermogravimetric analysis was carried out using an SDT Q600 (TA Instruments), and the samples were heated from room temperature to 600°C at 10 °C min⁻¹ rate under N₂ gas flow rate of 100 mL/min. ¹H NMR spectrum was recorded using a Bruker 400 MHz spectrometer. Energy calculations have been carried out by using the density function theory (DFT) exchange-correlation function B3LYP with basis set of 6-31+G**, to find out the optimized size of reactant and products.

Experimental section

Synthesis of [Co(4-ABPT)(HPA)(H₂O)], SSICG-8. A mixture of Co(OAc)₂·4H₂O (1 mmol), H₂HPA (1 mmol), and 4-ABPT (1 mmol) was taken in 5 mL of distilled water in a 10 mL glass vial. Then, the mixture was ultrasonicated for 10 min to make it homogeneous and heated to 150 °C for 3 days and then slowly cooled down to room temperature. Purple-colored, mixture of SSICG-8 were obtained, which were then filtered and thoroughly washed with water.

Synthesis of [Co(4-ABPT)(HPA) (H₂O)]·4H₂O, SSICG-9. A mixture of Co(OAc)₂·4H₂O (1 mmol), H₂HPA (1 mmol), and 4-ABPT (1 mmol) was taken in 5 mL of distilled water in a 10 mL glass vial. The mixture was ultrasonicated for 10 min to make it homogeneous and then heated at 90 °C for 10 minutes to make all the reactants soluble. After that, the temperature was cooled down to 30 °C. Purple-colored crystals of SSICG-9 was obtained after 3 days, which were then filtered and thoroughly washed with water.

Synthesis of [Co(BPY)(HPA)(H₂O)(CH₃OH)], SSICG-10. A mixture of Co(OAc)₂·4H₂O (1 mmol), H₂HPA (1 mmol), and 4,4'-bipyridine (BPY) (1 mmol) was taken in 5 mL of distilled water/methanol (1:1) in a 10 mL glass vial. Then, the mixture was stirred for 10 min to make it homogeneous and heated to 120 °C for 3 days and then slowly cooled down to room temperature. Purple-coloured, block-shaped X-ray quality crystals were obtained, which were then filtered and thoroughly washed with water.

Synthesis of [Co(4-ABPT)(HHPA)₂]·H₂O, SSICG-16. A mixture of Co(OAc)₂·4H₂O (1 mmol), H₂HPA (2 mmol), and 4,4'-bipyridine (BPY) (1 mmol) was taken in 5 mL of distilled water/methanol (1:1) in a 10 mL glass vial. Then, the mixture was stirred for 10 min to make it homogeneous and heated to 120 °C for 3 days and then slowly cooled down to room temperature. Purple-coloured, block-shaped X-ray quality crystals were obtained, which were then filtered and thoroughly washed with water.

Heterogeneous catalysis

The catalytic reactions were studied using the following reaction procedure. After completion of a reaction, the reaction mixture was centrifuged to separate the catalyst and washed with ethanol. Column chromatography was performed to purify the products and yield calculation. The products were analyzed by ¹H NMR. Catalysts were dried within a desiccator for another cycle and PXRD.

Three-component Strecker reaction. Aldehyde (1 mmol), aniline (1 mmol), trimethylsilyl cyanide (TMSCN) (1 mmol), and catalyst (0.5 mol%) were taken in a 10 mL round bottom flask. After 1 h of vigorous stirring, following general procedure, the crude product was collected and purified.

Hantzsch condensation reaction. In a 10 mL round bottom flask, aldehyde (1 mmol), ammonium acetate (1 mmol), and ethyl acetoacetate (2 mmol), were dissolved in 1 mL of ethanol. After adding 1.5 mol% catalyst, the reaction was carried out at 60 °C for 4 h. Following the general procedure, the crude product was collected and purified.

Crystallographic data and structure refinements

Good quality single crystal of the compound was sorted out with the help of a polarizing microscope. The single crystal XRD diffraction data was collected using BRUKER AXS (D8 Quest System) X-ray diffractometer, equipped with a PHOTON 100 CMOS detector. The source of X-ray was a Mo K α ($\lambda = 0.71073 \text{ \AA}$) radiation. Bruker Apex III software was used for data collection, unit cell measurements, absorption corrections, scaling, and integration.¹ The data were reduced, and an empirical absorption correction was applied with the help of SAINTPLUS and SADABS programs, respectively.²⁻³ SHELLXL97⁴ present in the WinGx (Version 2023.1) programs was used to solve the crystal structures. The WinGx package of programs was used to carry out the full-matrix least-squares refinement against the function $|F^2|$.⁵⁻⁷ The hydrogen atoms of the functional groups were fixed using the Olex2-1.5 package of programs.⁶⁻⁷ ‘OMIT’ command has been used to remove bad reflections. The structure detail of the compound is presented in Table S1. CCDC: 2358730, 2358731, 2358732, and 2382838 contain the crystallographic data of these compounds. These data are available from The Cambridge Crystallographic Data Center (CCDC) via www.ccdc.cam.ac.uk/data_request/cif.

Table S1: Crystal data and structure refinement parameters for SSICG-8, SSICG-9, SSICG-10 and SSICG-16.

| | SSICG-8 | SSICG-9 | SSICG-10 | SSICG-16 |
|----------------------------------|---------------------------------------|---|--|---|
| Empirical formula | Co(4-ABPT) (HPA)(H ₂ O) | [Co(4- ABPT)(HPA) (H ₂ O)]·4H ₂ O | Co(BPY)(HPA) (H ₂ O)(CH ₃ OH) | [Co(4-ABPT) (HHPA) ₂] · H ₂ O |
| Formula weight | 493.34 | 565.41 | 364.21 | 673.50 |
| Wavelength(λ) | 0.71073 \AA | 0.71073 \AA | 0.71073 \AA | 0.71073 \AA |
| Crystal system | monoclinic | monoclinic | monoclinic | Triclinic |
| Space group | <i>P</i> 2 ₁ / <i>n</i> | <i>P</i> 2 ₁ / <i>c</i> | <i>P</i> 2 ₁ / <i>n</i> | <i>P</i> ī |
| <i>a</i> [\AA] | 8.644(2) | 14.387(15) | 13.245(6) | 10.506(4) |
| <i>b</i> [\AA] | 8.559(2) | 19.88(2) | 8.885(4) | 11.357(5) |
| <i>c</i> [\AA] | 27.039(7) | 8.991(9) | 14.381(6) | 13.874(6) |
| α [°] | 90.000 | 90.000 | 90.000 | 111.26(2) |
| β [°] | 96.984(9) | 105.436(4) | 115.817(12) | 105.15(2) |
| γ [°] | 90.000 | 90.000 | 90.000 | 94.58(2) |
| Volume[\AA^3] | 1985.6(9) | 2480.1(4) | 1523.5(12) | 1460.7(11) |
| <i>Z</i> | 4 | 4 | 4 | 2 |
| Density [Mg/m ³] | 1.650 | 1.514 | 1.588 | 1.531 |
| Abs. coeff. [mm ⁻¹] | 0.915 | 0.754 | 1.151 | 0.655 |
| Abs. correction | None | None | None | None |
| F(000) | 1012 | 1172 | 748 | 694 |
| Reflections collected/ unique | 43082 / 4975 | 42484 / 7486 | 18208 / 3996 | 35761 / 5071 |

| R_{int} | 0.0493 | 0.0842 | 0.0396 | 0.1409 |
|--------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|------------------------------------|
| Data / restraints / parameters | 4975 / 0 / 304 | 7486 / 0 / 342 | 3996 / 0 / 210 | 5071 / 0 / 440 |
| Min. 20° | 2.498 | 2.520 | 1.744 | 2.001 |
| Max. 20° | 28.400 | 30.590 | 29.000 | 25.643 |
| Ranges (h, k, l) | -11≤h≤11, -11≤k≤11, -36≤l≤36 | -20≤h≤20, -28≤k≤28, -12≤l≤12 | -17≤h≤15, -11≤k≤11, -19≤l≤19 | -12≤h≤12, -13≤k≤13, -16≤l≤16 |
| Complete to 20(%) | 99.8 | 97.3 | 99.0 | 97.0 |
| Refinement method | Full-matrix least-squares on F^2 | Full-matrix least-squares on F^2 | Full-matrix least-squares on F^2 | Full-matrix least-squares on F^2 |
| Goof (F^2) | 1.138 | 1.040 | 1.165 | 1.069 |
| Final R indices [$I > 2\sigma(I)$] | $R_1 = 0.0390$, $wR_2 = 0.0744$ | $R_1 = 0.0557$, $wR_2 = 0.1221$ | $R_1 = 0.0529$, $wR_2 = 0.0948$ | $R_1 = 0.0951$, $wR_2 = 0.1829$ |
| R indices (all data) | $R_1 = 0.0522$, $wR_2 = 0.0808$ | $R_1 = 0.1083$, $wR_2 = 0.1553$ | $R_1 = 0.0691$, $wR_2 = 0.1019$ | $R_1 = 0.1759$, $wR_2 = 0.2315$ |
| CCDC No. | 2358730 | 2358731 | 2358732 | 2382838 |

Structural analysis

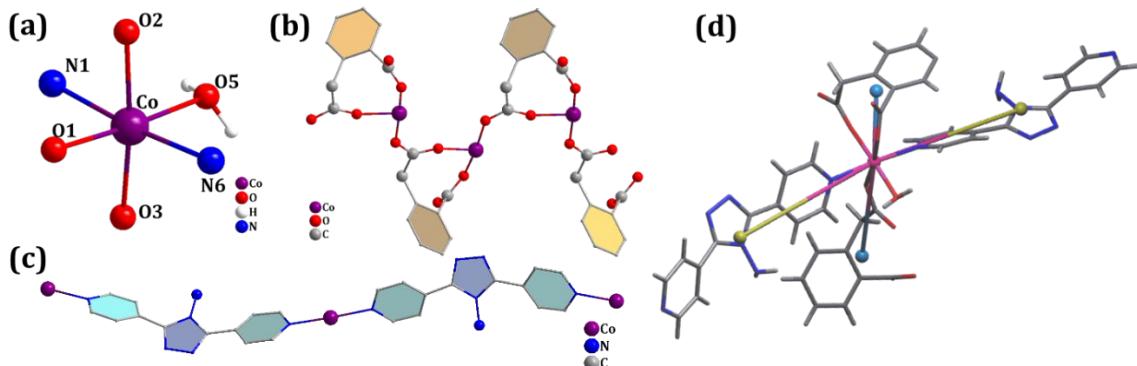


Figure S1. (a) Coordination environment of Co; binding motif of (b) HPA, (c) 4-ABPT; (d) topological representation of SSICG-8.

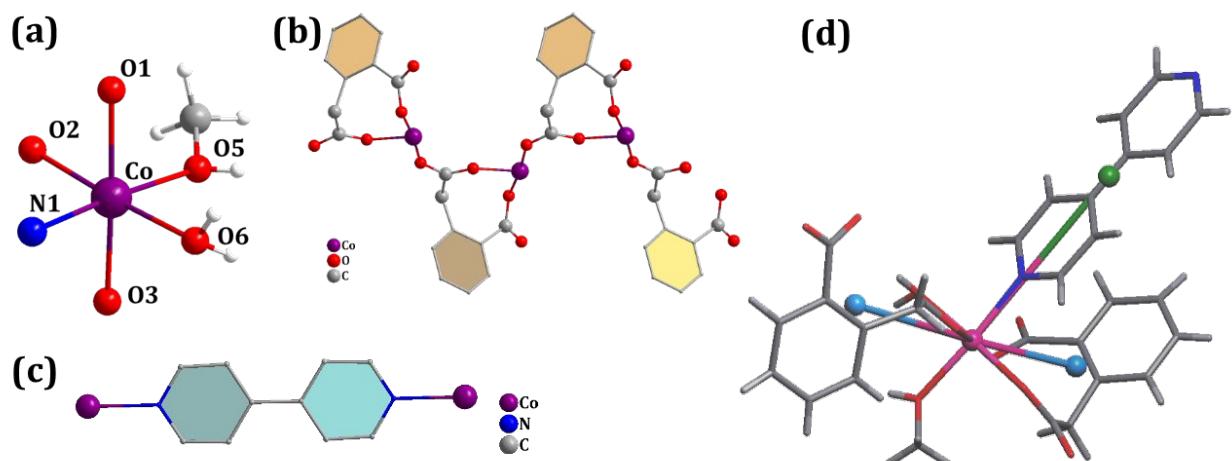


Figure S2. (a) Coordination environment of Co; binding motif of (b) HPA, (c) BPY; (d) topological representation of SSICG-10.

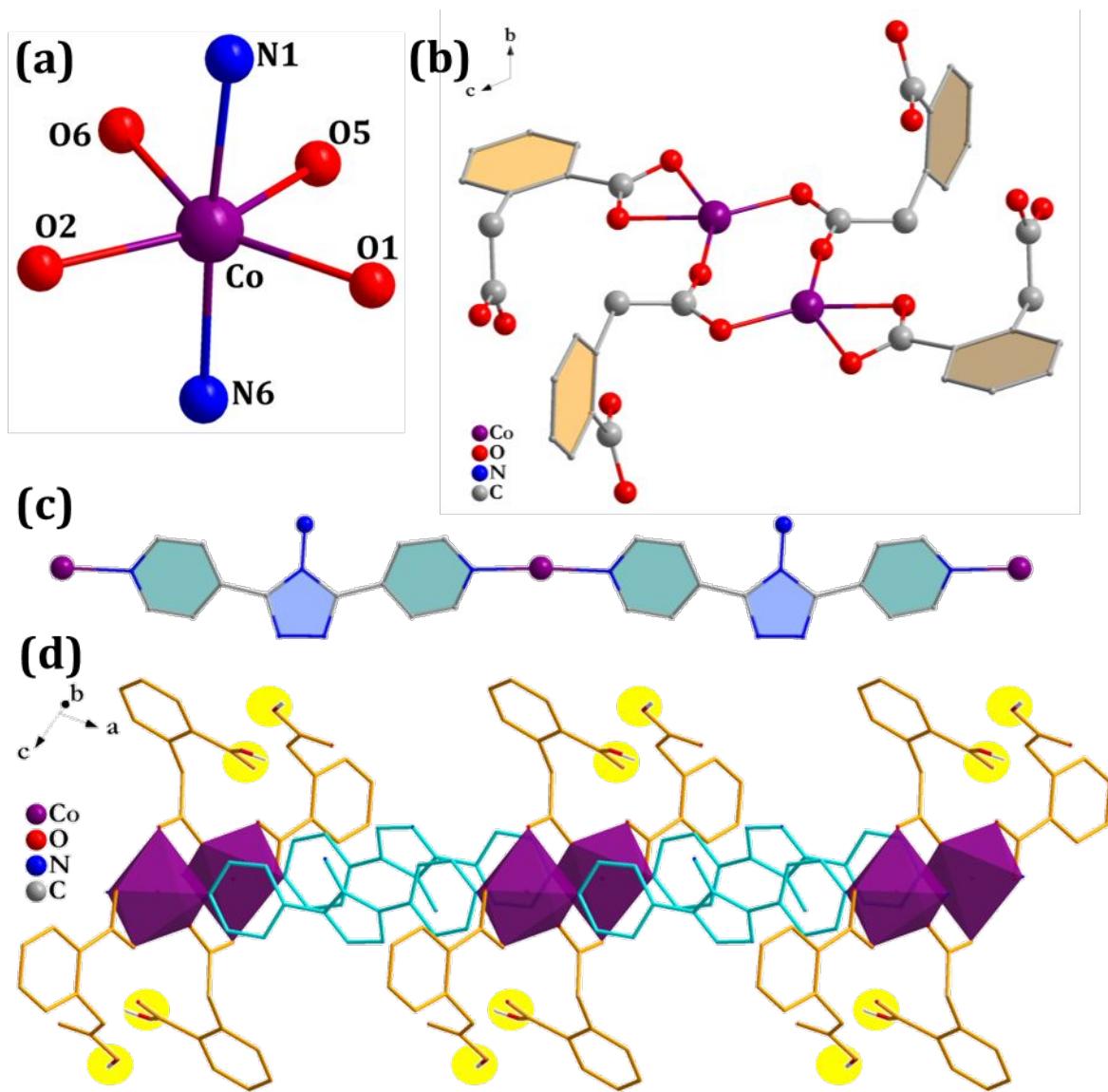


Figure S3. (a) Coordination environment of Co; binding motif of (b) HPA, (c) 4-ABPT; (d) 1D chain of SSICG-16 (protonated carboxylic acid groups of homophthalic acids are highlighted).

Characterization

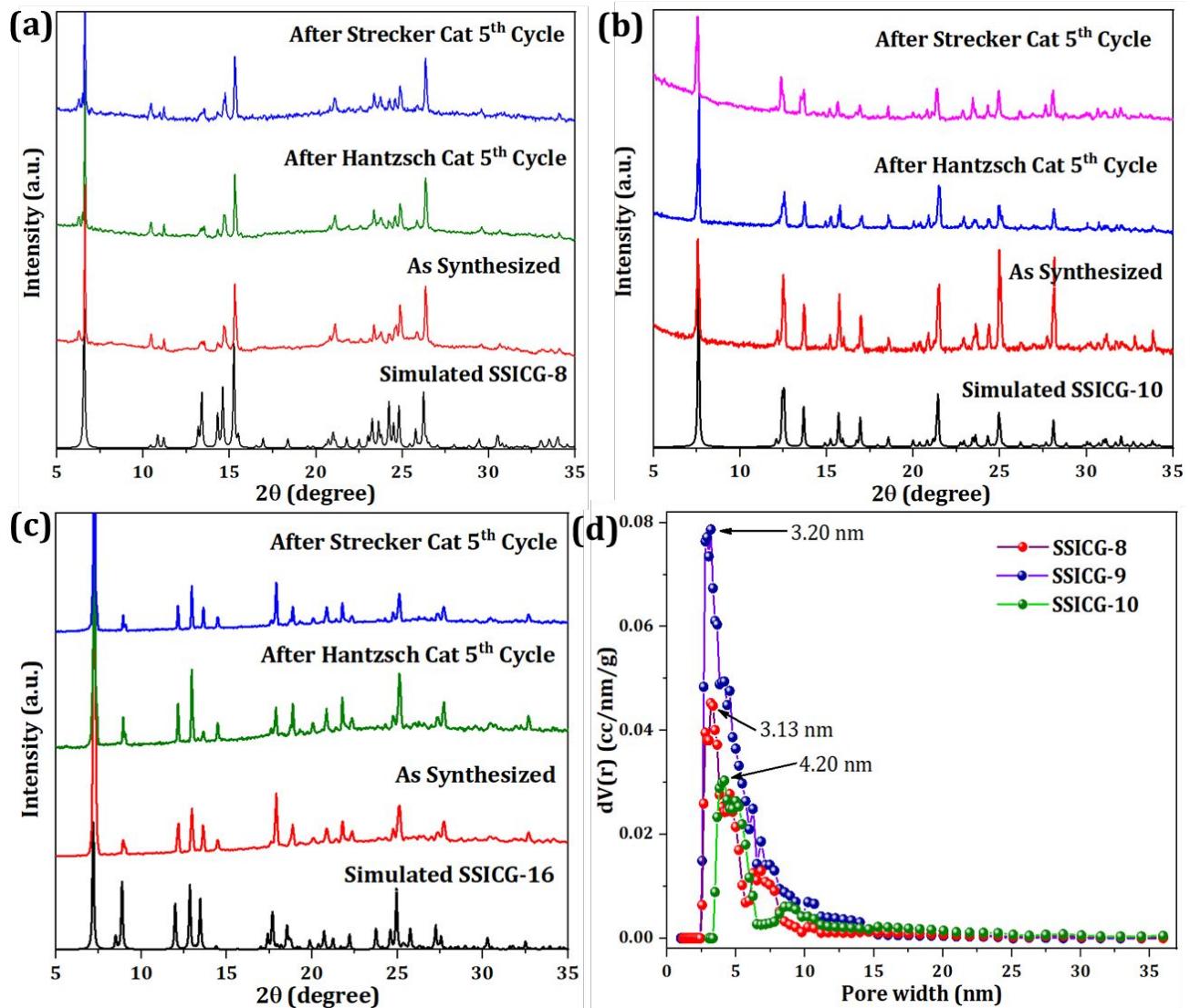


Figure S4. PXRD patterns of (a) SSICG-8, (b) SSICG-9, (c) SSICG-16 and (d) pore size distribution of SSICG-8, SSICG-9 and SSICG-10.

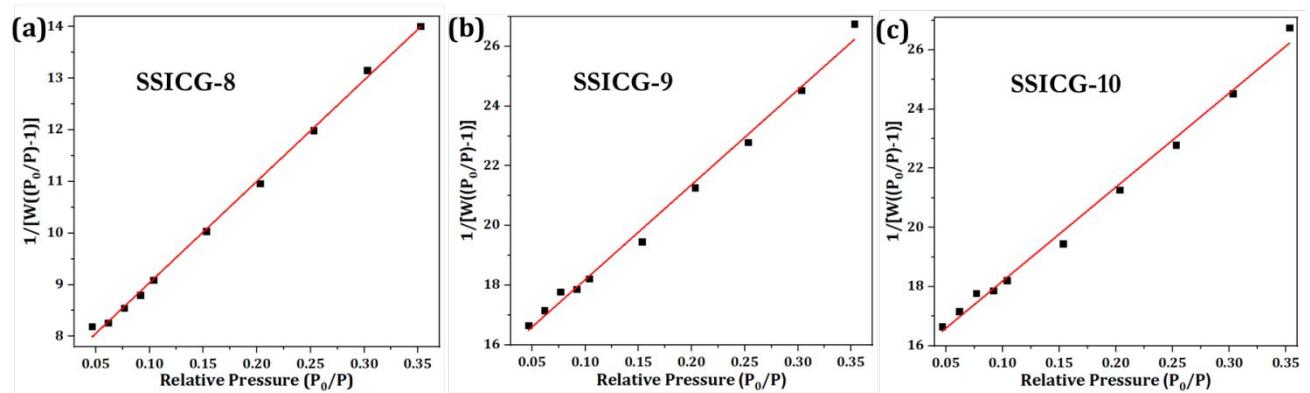


Figure S5. Multipoint BET plot of SSICG-8, SSICG-9 and SSICG-10.

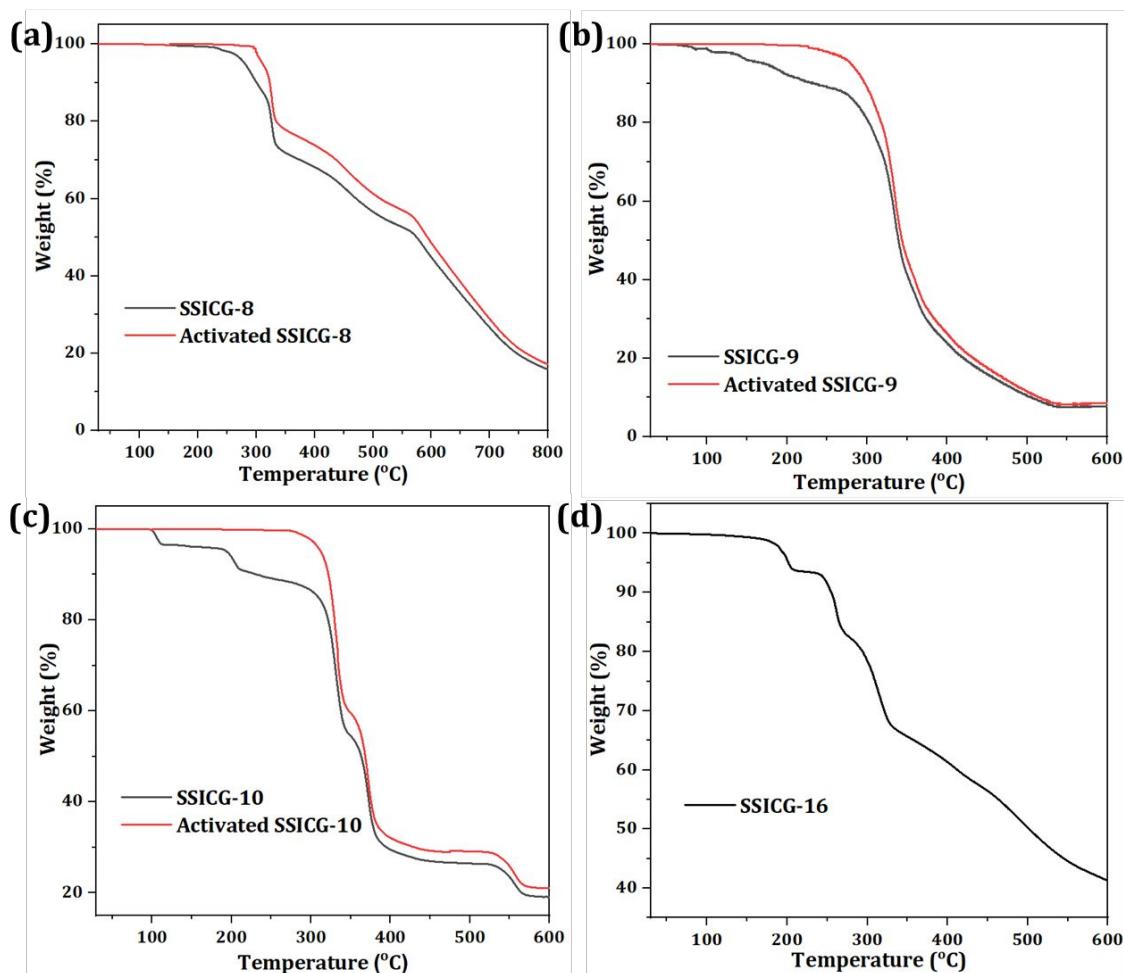


Figure S6. TGA plot of SSICG-8, SSICG-9, SSICG-10 and SSICG-16.

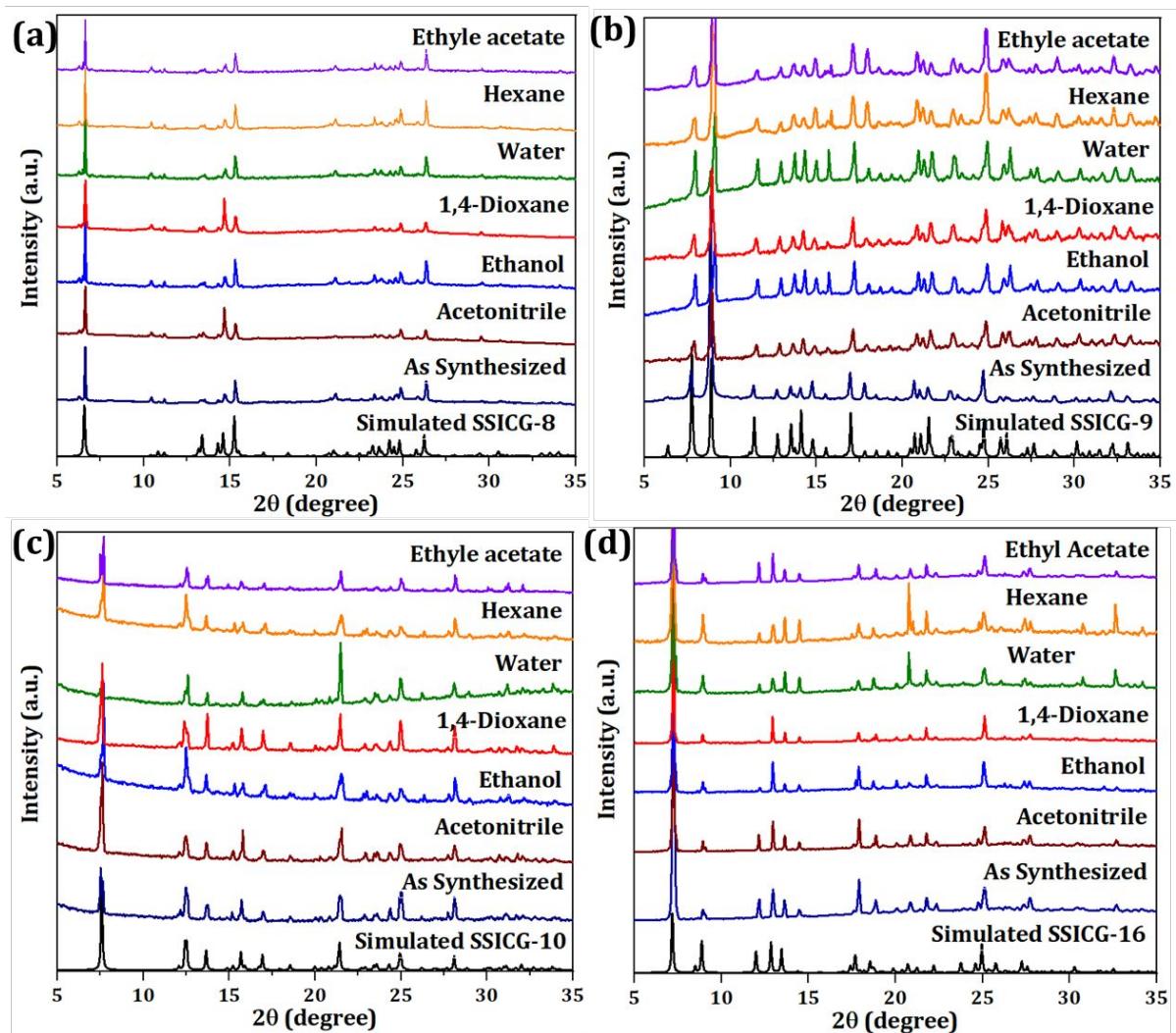


Figure S7. PXRD patterns after boiling SSICG-8, SSICG-9, SSICG-10 and SSICG-16 in conventional solvents for six hours.

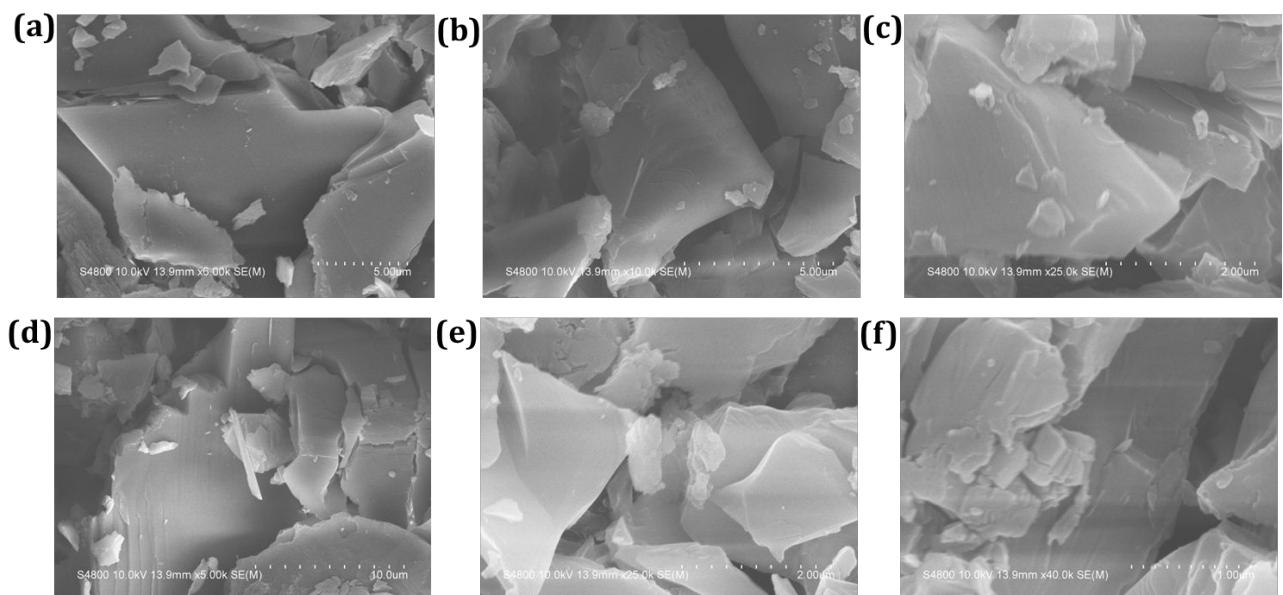


Figure S8. SEM images of (a) SSICG-9; after boiling in conventional solvents including (b) acetonitrile, (c) ethanol, (d) 1,4-dioxane, (e) water, (f) hexane for six hours.

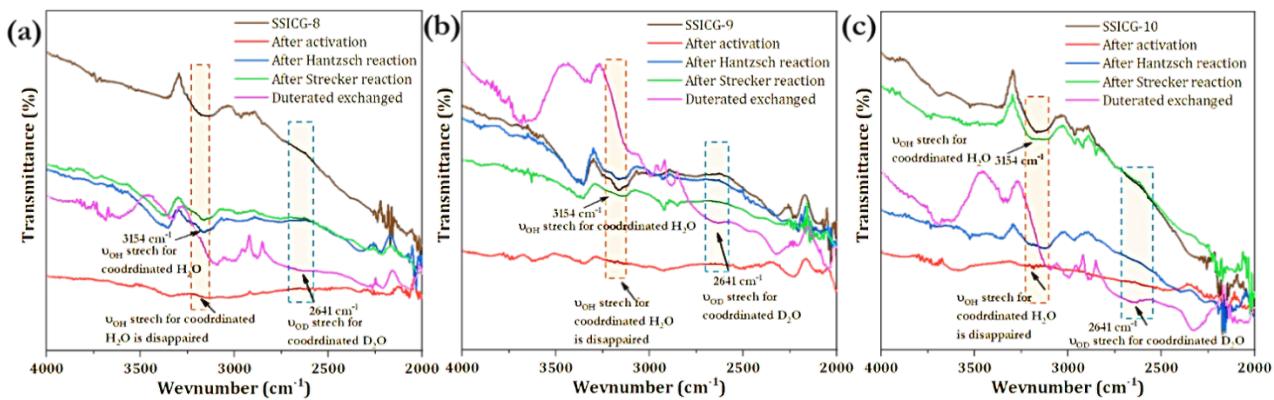


Figure S9. IR spectra of SSICG-8, SSICG-9 and SSICG-10 after activation, after catalysis and deuterated exchanges.

Three component Strecker reaction

Table S2. Controlled reaction data for the Strecker reactions^a

| Entry | Catalyst | Temperature (°C) | Time (h) | Yield ^b (%) |
|-------|---|------------------|----------|------------------------|
| 1 | Co(OAc) ₂ ·4H ₂ O | | | 24 |
| 3 | H ₂ HPA | | | 17 |
| 4 | 4-ABPT | | | - |
| 5 | Co(OAc) ₂ ·4H ₂ O + H ₂ HPA + 4-ABPT | rt | 1 | 23 |
| 6 | - | | | - |
| 7 | SSICG-16 | | | 38 |
| 8 | SSICG-10 | | | 76 |
| 9 | SSICG-8 | | | 84 |
| 10 | SSICG-9 | | | 96 |

^aReaction condition: benzaldehyde (1 mmol), aniline (1 mmol), TMSCN (1.1 mmol), 0.5 mol% of SSICG-9 used as a catalyst, solvent-free, rt.

^bIsolated yields based on aldehyde.

Table S3. Comparison table of CPs/MOFs used as heterogeneous catalysts for three-component Strecker reaction under solvent-free conditions.

| Entry | Catalyst | mol% | Temp (°C) | Time (h) | Yield (%) | Ref. |
|-------|--|------|-----------|----------|-----------|------|
| 1 | [Zn ₂ (hipamifba) ₂ (H ₂ O) ₂]·4H ₂ O | 2 | 25 | 6 | 79 | 8 |
| 2 | [Cd ₂ (hipamifba) ₂ (H ₂ O) ₄]·8H ₂ O | 2 | 25 | 6 | 100 | |
| 3 | In ₃ O(bt _b) ₂ (HCOO)L | 0.5 | 25 | 3.5 | 99 | 9 |
| 4 | In ₃₆ (μ-OH) ₂₄ (NO ₃) ₈ (Imtb) ₂₄ | 0.1 | 25 | 3 | 99 | 10 |
| 5 | In ₃ O(pbpta) _{1.5} (H ₂ O) ₃ | 0.88 | 25 | 0.5 | 99 | 11 |
| 6 | Cd ₂ (L)(H ₂ O)(DMF)]·3DMF·2H ₂ O | 1 | 25 | 4 | 99 | 12 |
| 7 | [Cd(bpp)(L)(H ₂ O)]·DMF | 3 | 30 | 6 | 91 | 13 |
| 8 | [Zn ₂ (3-tpom)(L) ₂]·2H ₂ O | 1 | 25 | 5 | 90 | 14 |
| 9 | [(CH ₃) ₂ NH ₂][Zn ₂ (L)(H ₂ O)(PO ₄)]·2DMF | 2.4 | 25 | 0.5 | 99 | 15 |
| 10 | [Cd ₄ (L ₁) ₄ (DMF) ₆] _n ·3n(DMF) | 1 | 80 | 4 | 96 | 16 |
| 11 | [In _{0.72} Ga _{0.28} (O ₂ C ₂ H ₄) _{0.5} (hfipbb)] | 1 | rt | 96 | 64 | 17 |
| 12 | [In _{0.55} Ga _{0.45} (O ₂ C ₂ H ₄) _{0.5} (hfipbb)] | 1 | rt | 1.33 | 91 | 17 |
| 13 | [Co ₂ (μ ₂ -O)(TDC) ₂ (L)(H ₂ O) ₂]·2DMF | 0.3 | 25 | 1 | 100 | 18 |

| | | | | | | |
|-----------|--|------------|-----------|----------|-----------|-----------|
| 14 | [Cd(hipamifba)(H ₂ O) ₂]·2H ₂ O | 2 | 25 | 6 | 100 | 19 |
| 15 | [Zn(hipamifba)(H ₂ O)]·2H ₂ O | 2 | 25 | 6 | 79 | 19 |
| 16 | [Zn ₄ (μ ₃ -OH) ₂ (d-2,4-cbs) ₂ (H ₂ O) ₄]·5H ₂ O | 5 | 40 | 5 | 92 | 20 |
| 17 | [In ₃ (NIPH) ₃ (HNIPH)(OH) ₂]·4H ₂ O | 9.6 | rt | 24 | 96 | 21 |
| 18 | [Bi ₁₄ (μ ₃ -O) ₉ (μ ₄ -O) ₂ (μ ₃ -OH) ₅ (3,5-DSB) ₅ (H ₂ O) ₃]·7H ₂ O | 1 | rt | 4 | 95 | 22 |
| 19 | SSICG-16 | 0.5 | 25 | 1 | 38 | This work |
| 20 | SSICG-10 | 0.5 | 25 | 1 | 76 | |
| 21 | SSICG-8 | 0.5 | 25 | 1 | 84 | |
| 22 | SSICG-9 | 0.5 | 25 | 1 | 96 | |

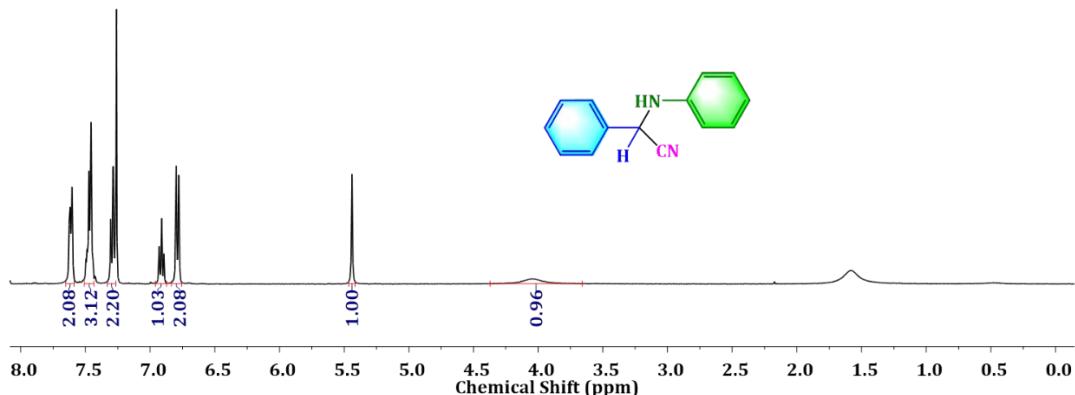


Figure S10. ¹H NMR spectra for 1a.

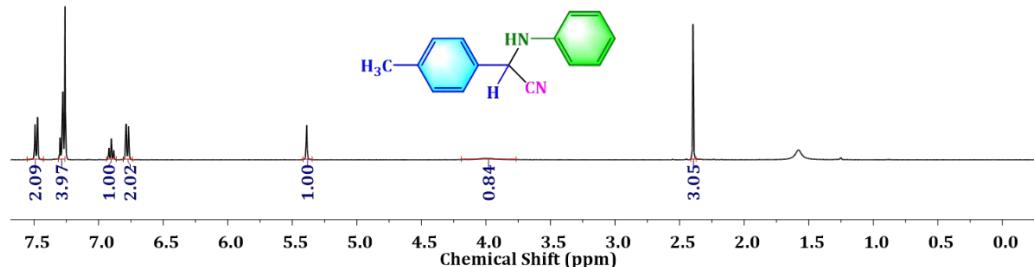


Figure S11. ¹H NMR spectra for 1b.

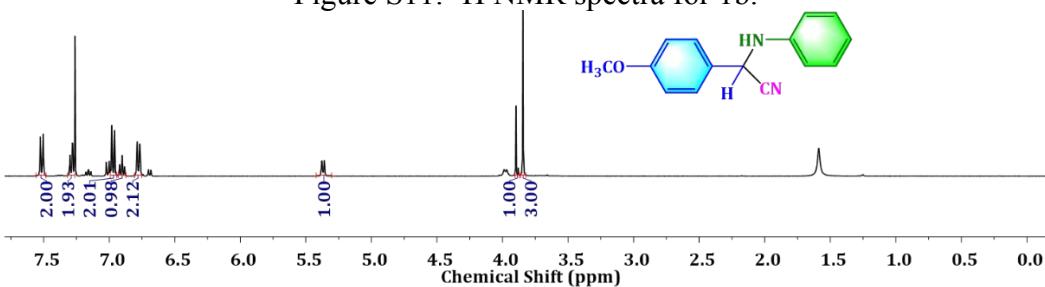


Figure S12. ¹H NMR spectra for 1c.

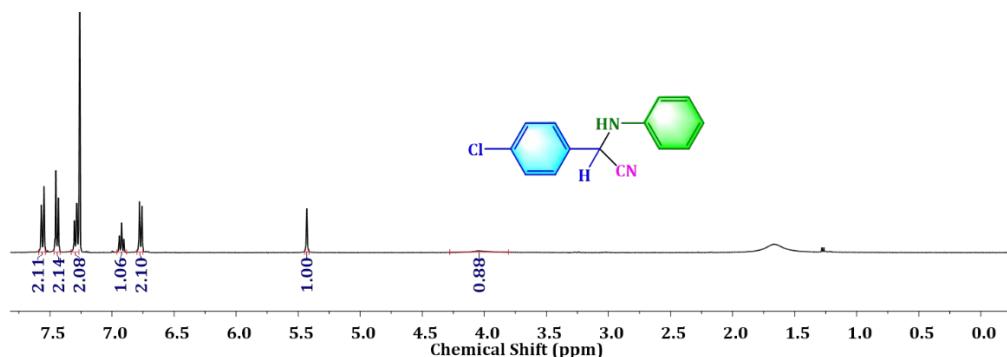


Figure S13. ^1H NMR spectra for 1d.

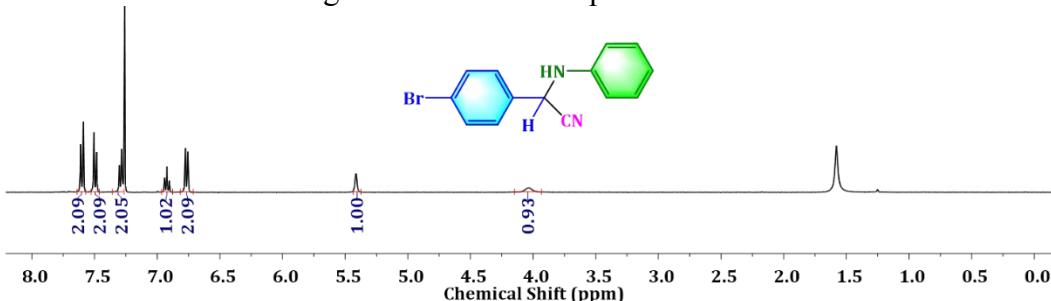


Figure S14. ^1H NMR spectra for 1e.

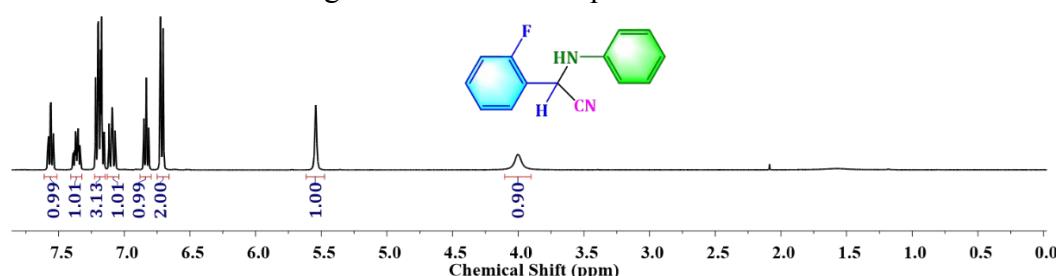


Figure S15. ^1H NMR spectra for 1f.

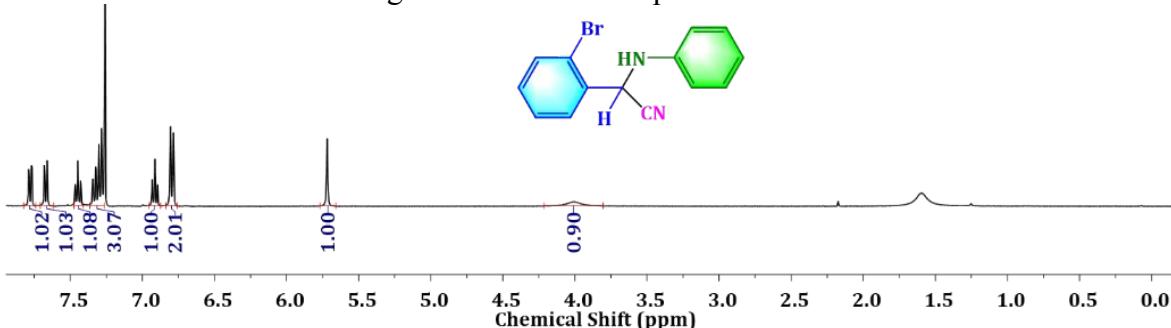


Figure S16. ^1H NMR spectra for 1g.

Hantzsch condensation reaction

Table S4. Optimization table for Hantzsch condensation reaction^a

| Entry | Solvent | Cat. SSICG-9 (mol%) | Time (h) | Temperature (°C) | Yield ^b (%) |
|-------|------------------|---------------------|----------|------------------|------------------------|
| 1 | - | 1.5 | 4 | 60 | 13 |
| 2 | H ₂ O | | | | 22 |
| 3 | MeOH | | | | 54 |
| 4 | EtOH | | 3 | | 95 |
| 5 | | | | | 76 |

| | | | | | |
|----|--|-----|-----|----|----|
| 6 | | | 1.5 | | 64 |
| 8 | | 1.0 | | | 86 |
| 9 | | 0.5 | | | 79 |
| 10 | | | 4 | 60 | 71 |
| 11 | | 1.5 | | 50 | 53 |
| | | | | 40 | |

^aReaction condition: benzaldehyde (1 mmol), ammonium acetate (1 mmol), ethyl acetoacetate (2 mmol), SSICG-9 used as a catalyst.

^bIsolated yields based on aldehyde.

Table S5. Controlled reaction data for the Hantzsch condensation reactions^a

| Entry | Catalyst | Solvent | Temp. (°C) | Time (h) | Yield ^b (%) |
|----------------|---|---------|------------|----------|------------------------|
| 1 | Co(OAc) ₂ ·4H ₂ O | EtOH | 60 | 4 | 26 |
| 3 | H ₂ HPA | | | | 19 |
| 4 | 4-ABPT | | | | - |
| 5 | Co(OAc) ₂ ·4H ₂ O + H ₂ HPA + 4-ABPT | | | | 29 |
| 6 ^b | SSICG-9 | | | | 48 |
| 7 | - | | | | - |
| 8 | SSICG-16 | | | | 35 |
| 9 | SSICG-10 | | | | 78 |
| 10 | SSICG-8 | | | | 81 |

^aReaction condition: benzaldehyde (1 mmol), ethyl acetoacetate (2 mmol), ammonium acetate (1 mmol), solvent (1 mL), catalyst (1.5 mol %). ^bIsolated yields based on aldehyde.

^bCatalyst was removed after 30 min

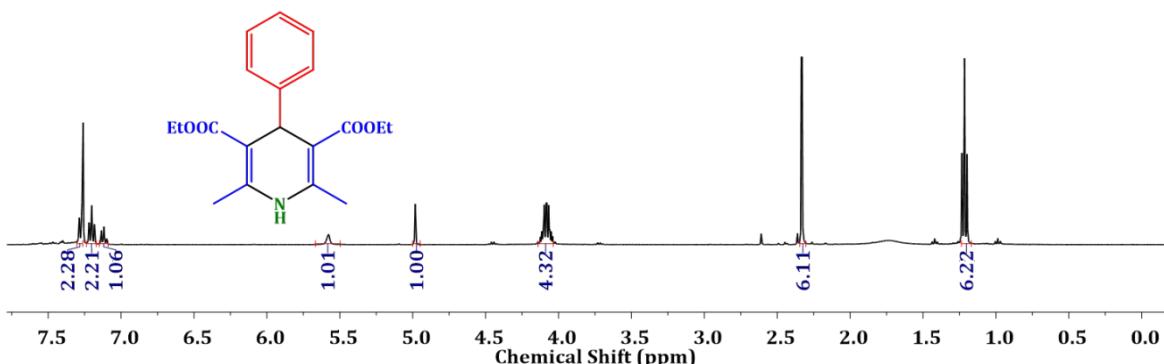


Figure S17. ¹H NMR spectra for 2a.

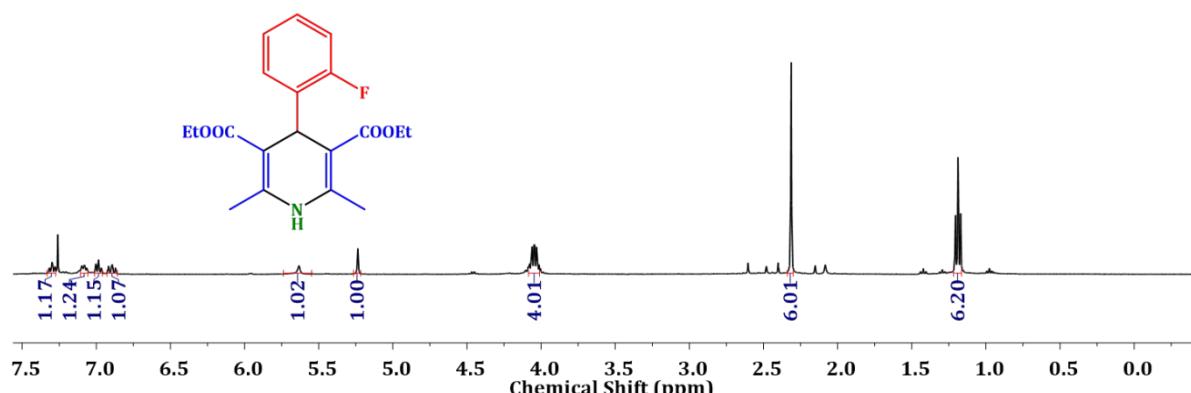


Figure S18. ¹H NMR spectra for 2b.

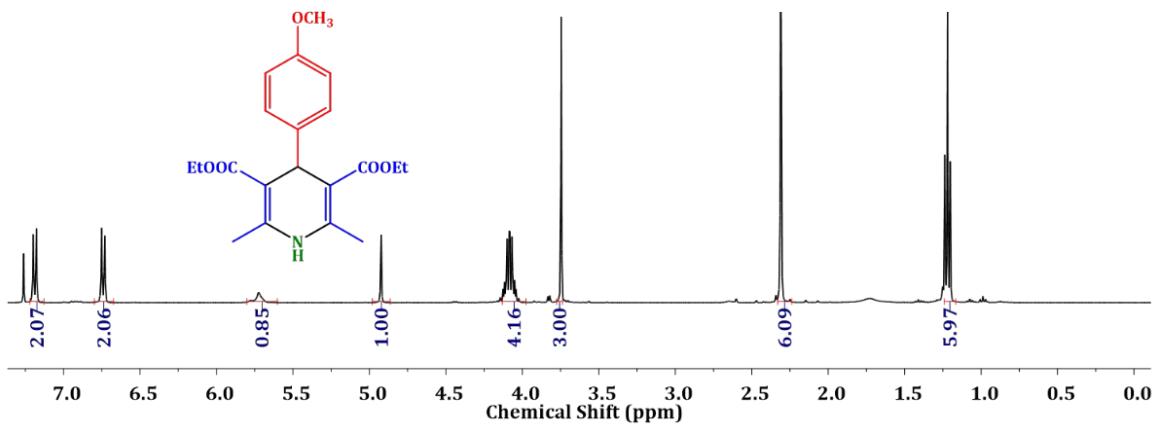


Figure S19. ¹H NMR spectra for 2c.

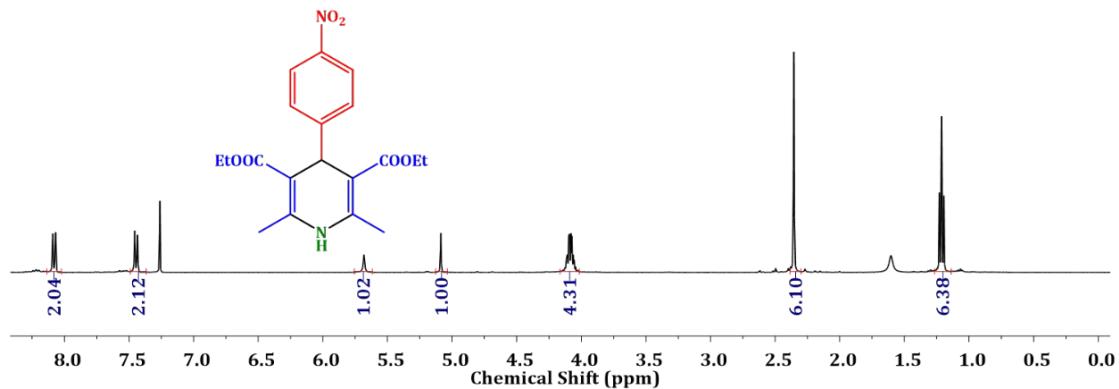


Figure S20. ¹H NMR spectra for 2d.

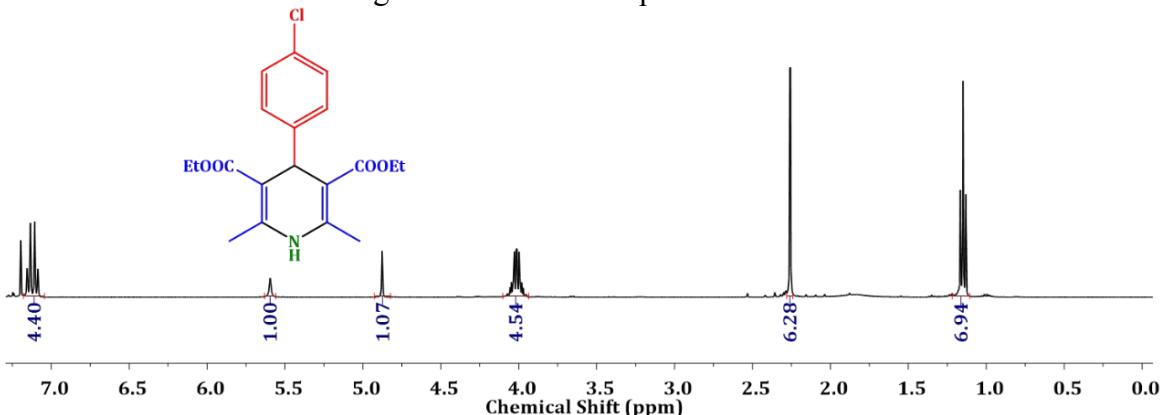


Figure S21. ¹H NMR spectra for 2e.

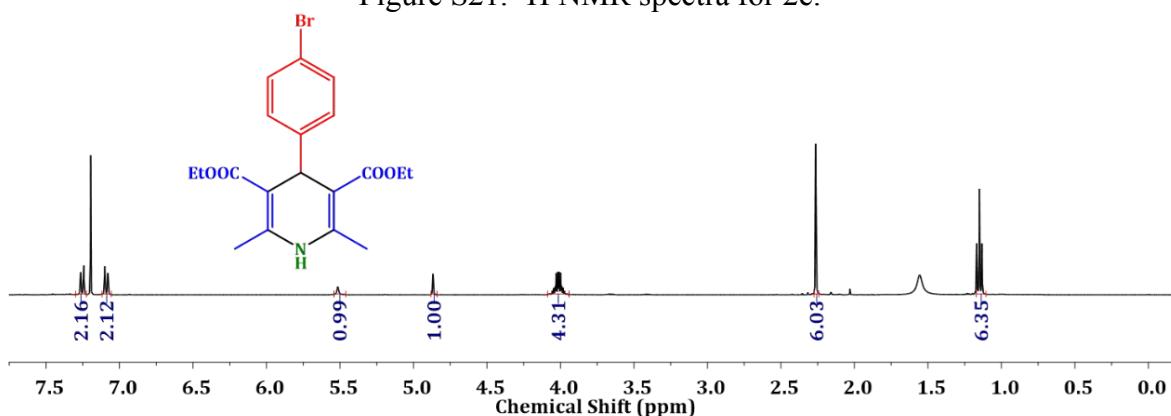


Figure S22. ¹H NMR spectra for 2f.

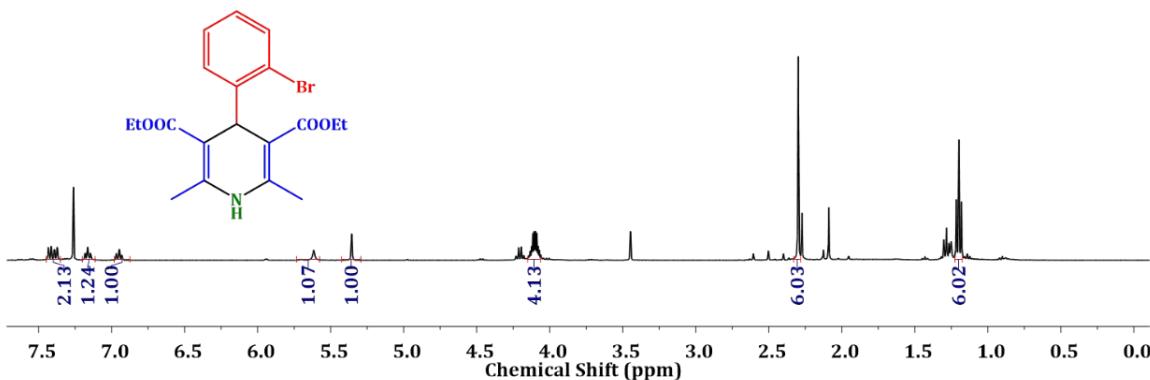


Figure S23. ¹H NMR spectra for 2g.

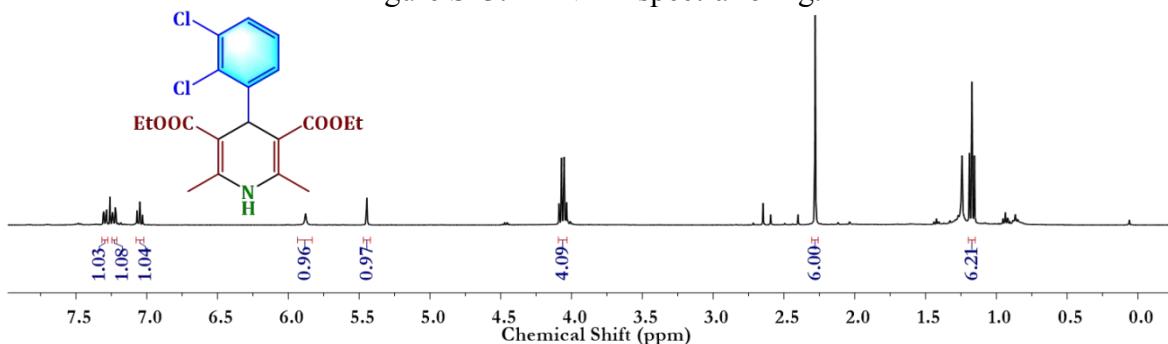


Figure S24. ¹H NMR spectra for Nemadipine B drug molecule.

Table S6. Comparison table for the catalytic Hantzsch condensation performance of with other reported heterogeneous catalysts.

| Entry | Catalyst | Temp (°C) | Time (h) | Yield (%) | Ref. |
|-----------|---|-----------|----------|-----------|------------------|
| 1 | TMU-33 | rt | 2 | 96 | ²³ |
| 2 | Fe-TUD-1 | 80 | 5 | 76 | ²⁴ |
| 3 | Zr-SBA-16 | 80 | 3 | 77 | ²⁵ |
| 4 | IR-MOF-3 | reflux | 5 | 89 | ²⁶ |
| 5 | Cu(II)-MOF | 60 | 2 | 98 | ²⁷ |
| 6 | Dy(DBM) ₃ .bpy | 80 | 5 | 93 | ²⁸ |
| 7 | Cd(H ₄ L) _{0.5} (4,4'-bpy) _{0.5} (H ₂ O) ₂ | 60 | 4 | 99 | ²⁹ |
| 8 | MIL-101(Cr) | 80 | 2 | 98 | ³⁰ |
| 9 | FeAl ₂ O ₄ | 100 | 3 | 90 | ³¹ |
| 10 | Fe ₃ O ₄ -TEDETA-Br ₃ | 80 | 2 | 92 | ³² |
| 11 | Cu(L1)(H ₂ O) ₂ | 90 | 2 | 98 | ³³ |
| 12 | Er(III)-MOF | 70 | 4 | 85 | ³⁴ |
| 13 | MIL-101-SO ₃ H | 60 | 8 | 99 | ³⁵ |
| 14 | Mn-MOF | 80 | 0.5 | 98 | ³⁶ |
| 15 | SSICG-16 | 60 | 4 | 35 | This work |
| 16 | SSICG-10 | 60 | 4 | 78 | |
| 17 | SSICG-8 | 60 | 4 | 81 | |
| 18 | SSICG-9 | 60 | 4 | 95 | |

Table S7. Selected bond distances (Å) and bond angles (°).

SSICG-8

| | | | | | |
|---------|------------|-----------|------------|-----------|------------|
| Co-O(1) | 2.0583(16) | Co-O(5) | 2.0837(16) | Co-N(6)#2 | 2.1619(17) |
| Co-O(3) | 2.0770(16) | Co-O(2)#1 | 2.1045(15) | Co-N(1) | 2.1695(17) |

| | | | |
|----------------|-----------|------------------|-----------|
| O(1)-Co-O(3) | 97.17(6) | O(5)-Co-N(6)#2 | 88.23(6) |
| O(1)-Co-O(5) | 176.90(7) | O(2)#1-Co-N(6)#2 | 88.85(6) |
| O(3)-Co-O(5) | 85.81(7) | O(1)-Co-N(1) | 89.99(7) |
| O(1)-Co-O(2)#1 | 80.66(6) | O(3)-Co-N(1) | 87.09(6) |
| O(3)-Co-O(2)#1 | 174.04(6) | O(5)-Co-N(1) | 89.28(6) |
| O(5)-Co-O(2)#1 | 96.30(6) | O(2)#1-Co-N(1) | 87.37(6) |
| O(1)-Co-N(6)#2 | 92.28(7) | N(6)#2-Co-N(1) | 175.22(7) |
| O(3)-Co-N(6)#2 | 96.80(6) | | |

Symmetry transformations used to generate equivalent atoms. #1 -x+1/2,y+1/2,-z+3/2; #2 x-1/2,-y+3/2,z+1/2

SSICG-9

| | | | | | |
|------------|----------|--------------|----------|--------------|----------|
| Co(1)-O(1) | 2.070(2) | Co(1)-O(5) | 2.085(2) | Co(1)-N(1) | 2.169(2) |
| Co(1)-O(3) | 2.081(2) | Co(1)-O(4)#1 | 2.125(2) | Co(1)-N(6)#2 | 2.188(2) |

| | | | |
|-------------------|-----------|---------------------|------------|
| O(1)-Co(1)-O(3) | 97.45(9) | O(5)-Co(1)-N(1) | 87.99(9) |
| O(1)-Co(1)-O(5) | 87.50(10) | O(4)#1-Co(1)-N(1) | 85.19(8) |
| O(3)-Co(1)-O(5) | 174.98(9) | O(1)-Co(1)-N(6)#2 | 87.89(9) |
| O(1)-Co(1)-O(4)#1 | 177.49(8) | O(3)-Co(1)-N(6)#2 | 85.76(9) |
| O(3)-Co(1)-O(4)#1 | 83.08(8) | O(5)-Co(1)-N(6)#2 | 95.30(9) |
| O(5)-Co(1)-O(4)#1 | 92.01(9) | O(4)#1-Co(1)-N(6)#2 | 89.70(8) |
| O(1)-Co(1)-N(1) | 97.24(9) | N(1)-Co(1)-N(6)#2 | 174.03(10) |
| O(3)-Co(1)-N(1) | 90.55(9) | | |

Symmetry transformations used to generate equivalent atoms. #1 x,-y+1/2,z+1/2; #2 x-1,y,z-1.

SSICG-10

| | | | | | |
|--------------|----------|------------|----------|------------|----------|
| Co(1)-O(1) | 2.069(2) | Co(1)-O(3) | 2.095(2) | Co(1)-N(1) | 2.145(2) |
| Co(1)-O(2)#1 | 2.088(2) | Co(1)-O(5) | 2.096(2) | Co(1)-O(6) | 2.149(2) |

| | | | |
|-------------------|-----------|-------------------|-----------|
| O(1)-Co(1)-O(2)#1 | 80.41(8) | O(3)-Co(1)-N(1) | 92.12(9) |
| O(1)-Co(1)-O(3) | 95.02(8) | O(5)-Co(1)-N(1) | 88.03(8) |
| O(2)#1-Co(1)-O(3) | 174.83(8) | O(1)-Co(1)-O(6) | 91.39(9) |
| O(1)-Co(1)-O(5) | 176.26(8) | O(2)#1-Co(1)-O(6) | 90.59(10) |
| O(2)#1-Co(1)-O(5) | 96.53(8) | O(3)-Co(1)-O(6) | 87.09(9) |
| O(3)-Co(1)-O(5) | 87.95(8) | O(5)-Co(1)-O(6) | 86.49(8) |
| O(1)-Co(1)-N(1) | 94.12(9) | N(1)-Co(1)-O(6) | 174.49(9) |
| O(2)#1-Co(1)-N(1) | 90.62(9) | | |

Symmetry transformations used to generate equivalent atoms. #1 -x+3/2,y+1/2,-z+1/2; #2 -x+1,-y+1,-z+1.

SSICG-16

| | | | | | |
|--------------|----------|--------------|----------|------------|----------|
| Co(1)-O(1) | 2.070(6) | Co(1)-N(1) | 2.140(5) | Co(1)-O(5) | 2.160(6) |
| Co(1)-O(2)#1 | 2.096(5) | Co(1)-N(6)#2 | 2.152(6) | Co(1)-O(6) | 2.264(5) |

| | | | |
|---------------------|----------|-------------------|-----------|
| O(1)-Co(1)-O(2)#1 | 122.0(2) | N(1)-Co(1)-O(5) | 91.8(2) |
| O(1)-Co(1)-N(1) | 88.3(2) | N(6)#2-Co(1)-O(5) | 84.9(2) |
| O(2)#1-Co(1)-N(1) | 93.7(2) | O(1)-Co(1)-O(6) | 146.0(2) |
| O(1)-Co(1)-N(6)#2 | 88.9(2) | O(2)#1-Co(1)-O(6) | 92.00(19) |
| O(2)#1-Co(1)-N(6)#2 | 90.3(2) | N(1)-Co(1)-O(6) | 90.1(2) |
| N(1)-Co(1)-N(6)#2 | 175.8(2) | N(6)#2-Co(1)-O(6) | 90.5(2) |
| O(1)-Co(1)-O(5) | 87.0(2) | O(5)-Co(1)-O(6) | 59.11(19) |
| O(2)#1-Co(1)-O(5) | 150.6(2) | | |

Symmetry transformations used to generate equivalent atoms. #1 -x+1,-y+2,-z+2 #2 x+1,y+1,z.

Table S8. H-bonding interactions

SSICG-8

| D --HA | d(H...A) (Å) | D(D...A) (Å) | < DHA (°) |
|-----------------|--------------|--------------|-----------|
| O5 --H5A ..O4#1 | 1.96 | 2.760(2) | 157 |
| O5 --H5C ..O2#2 | 2.02 | 2.806(2) | 154 |
| O5 --H5C ..O1#3 | 2.31 | 2.916(2) | 128 |

Symmetry transformations used to generate equivalent atoms. #1 1/2-x,-1/2+y,1/2-z; #2 x,-1+y, z ; #3 3/2-x,-1/2+y,1/2-z

SSICG-9

| D --HA | d(H...A) (Å) | D(D...A) (Å) | < DHA (°) |
|--------------------|--------------|--------------|-----------|
| O5 --H5A ..O4#1 | 2.41 | 3.075 (3) | 134 |
| O5 --H5A ..O3#2 | 2.01 | 2.787(3) | 148 |
| O5 --H5B ..O100#3 | 1.99 | 2.676(4) | 135 |
| N5 --H5D ..N2#2 | 2.36 | 3.074(4) | 141 |
| N5 --H5E ..O2#4 | 2.00 | 2.872(4) | 172 |
| O103 --H10B ..O1#1 | 2.18 | 3.153(4) | 173 |
| O103 --H10B ..O2#1 | 2.52 | 3.227(4) | 130 |
| O101 --H10C ..O2#5 | 2.13 | 2.839(4) | 141 |

Symmetry transformations used to generate equivalent atoms. #1 x,y,1+z; #2 x,1/2-y,1/2+z; #3 -x,-1/2+y,3/2-z; #4 1-x,-y,2-z; #5 x,1/2-y,-1/2+z

SSICG-10

| D --HA | d(H...A) (Å) | D(D...A) (Å) | < DHA (°) |
|-----------------|--------------|--------------|-----------|
| O5 --H5A ..O3#1 | 2.05 | 2.755(3) | 138 |
| O5 --H5B ..O2#2 | 2.23 | 3.074(3) | 165 |
| O5 --H5B ..O1#3 | 2.37 | 2.824(3) | 113 |

Symmetry transformations used to generate equivalent atoms. #1 1-x, 1-y, -z; #2 x,1+y, z; #3 3/2-x,1/2+y,1/2-z.

SSICG-16

| D --H ...A | d(H...A) (Å) | D(D...A) (Å) | < DHA (°) |
|--------------------|--------------|--------------|-----------|
| O4 --H4 ..O100#1 | 1.87 | 2.673(10) | 167 |
| N5 --H5A ..O6#2 | 2.18 | 3.017(10) | 139 |
| N5 --H5B ..O2#3 | 2.18 | 2.817(10) | 134 |
| O7 --H7 ..O8#4 | 2.01 | 2.817(11) | 169 |
| O100 --H10B ..N3#5 | 2.02 | 2.870(9) | 177 |
| O100 --H10C ..O6#6 | 2.15 | 2.967(9) | 160 |

Symmetry transformations used to generate equivalent atoms. #1 x,-1+y,z; #2 1-x,1-y,-z; #3 x,1+y,z; #4 1-x,-y,1-z; #5 -1+x,y,z; #6 1+x,y,z.

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