Supporting Information

Lithographically organized 1D nano-tape arrays composed of solution processable above room temperature spin cross-over iron(II) coordination polymer

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GENERAL EXPERIMENTAL METHODS:

Materials: Citrazinic acid, (COCl)2, I2, trifloro acetic acid, tetramethylammonium chloride, [Pd(PPh3)4] and deuterated solvent CDCl3-d1 was obtained from Aldrich. K2CO3, LiOH, Cu(I)I, PPh3 were purchased from Avra Synthesis, Hyderabad, India. THF, Triethylamine, benzene, dichloromethane, hexane, pet-ether, CHCl3 and methanol solvents were obtained from Finar Chemicals Limited, Ahmedabad, India. All solvent were used after distillation. Methanol, HCl and NaN3 obtained from Merck. MgSO4 and Na2S2O3 were purchased from SRL chemicals. pvt. limited, Hyderabad. For UV-Vis and fluorescence measurements spectroscopic grade solvents were used.
**Instrumentation:** $^1$H and $^{13}$C NMR spectroscopic data were recorded on a Bruker DPX 400 spectrometer with solvent proton as internal standard (CDCl$_3$-d$_1$ = 7.26 ppm). LC mass spectrometry was performed on Shimadzu LCMS-2010A mass spectrometer. IR spectra were recorded on JASCO FT/IR-5300 or Nicolet 5700 FT-IR. Elemental analysis was recorded on a Thermo Finnigan Flash EA 1112 analyzer. Spin coating was done on a glass substrate using Laurell TECHNOLOGIES CORPORATION Model WS-400B-6NPP/LITE/8K Spin-coater. The molecular weights were determined by PSS-WinGPC (PSS) (pump: alliance GPC 2000) GPC equipped with an RI detector using a PLgel MIXED-B column (particle size: 10mm, dimensions: 0.8 × 30 cm) calibrated against polystyrene standards. For thin-layer chromatography (TLC), silica gel plates Merck 60 F254 were used and compounds were visualized by irradiation with UV light. UV-Visible absorption and fluorescence spectra were recorded on a spectrophotometer. The solid and liquid state absorbance spectra were collected from a Shimadzu UV-3600 spectrometer and a spectrofluorimeter (Horiba, Jobin Yvon) respectively. For fluorescence quantum yield measurements, solution of ligands in DCM was matched optically at an absorbing wavelength and then the quantum yield of quinine-sulfate in 0.1M H$_2$SO$_4$ ($\Phi_f$ = 0.57, at 22 °C) was used as reference.

**Atomic Force Microscopy Studies:** Atomic force microscopy (AFM) was carried out on NT-MDT Model Solver Pro M microscope or Wi-Tec confocal Raman spectrometer coupled with AFM. For the NT-MDT Model Solver Pro M microscope we have used a class 2R laser of 650 nm wavelength having maximum output of 1 mW. All calculations and image processing were carried out by using NOVA 1.0.26.1443 software provided by the manufacturer. The images were recorded in a semi-contact mode using a super sharp silicon cantilever (NSG 10_DLC) with a diamond like carbon tip (NT-MDT, Moscow). The dimension of the tip is as follows: cantilever length = 100 (± 5) μm, cantilever width 35 (± 5) μm, and cantilever thickness = 1.7–2.3 μm, resonance frequency = 190–325 kHz, force constant = 5.5–22.5 N/m, chip size = 3.6 × 1.6 × 0.4 mm, reflective side = Au, tip height = 10–20 μm, and DLC tip curvature radius = 1–3 nm.

**Confocal Raman micro-spectroscopy Studies:** Raman spectra of the samples were recorded on a WI-Tec confocal Raman spectrometer equipped with a Peltier-cooled CCD detector. Using a 600 grooves/mm grating BLZ = 500 nm, the accumulation time was typically 10 s and integration
time was typically 0.5000 s. Ten accumulations was performed for acquiring a single spectrum. A Ar\(^+\) ion laser operating at 488 nm was used as an excitation source for the Raman scattering. All measurements were collected in air.

**Stamps for Lithography**: Elastomeric poly(dimethylsiloxane) (Sylgard 184 Down Corning) stamps were prepared by replica molding of a series of structured master. The curing process was carried out for 6 h at 60 °C. Once cured, the replica was carefully peeled off from the master and used as such for nano/micro patterning techniques.

**Electron Microscopy Studies**: Size and morphology of the micro structures were examined by using a Philips XL30 ESEM Scanning Electron Microscope (SEM) using a beam voltage of 20 KV. Transmission electron microscope (TEM) measurement was carried out on Tecnai G2 FEI F12 instrument at an accelerating voltage of 120 kV. Carbon coated TEM grids (200 Mesh Type B) were purchased from TED PELLA INC. USA.

**VSM-SQUID Studies**: The temperature dependent magnetic susceptibility of a pellet sample of coordination polymer 1 was measured on a quantum design vibrating sample magnetometer (VSM-SQUID) set-up in the temperature range of 340 ↔ 2 K at continuous cooling (↓) and heating (↑) cycles with an applied DC magnetic field of 0.5 T.

**Preparation of [Fe\(^{II}\)(L)]\(_n\) \cdot 2nClO\(_4\) (1\(^2\))**: A 100 mL flask was charged with L (30 mg, 0.0273 mmol) and 10 mL of DCM was added to it. A solution of Fe(ClO\(_4\))\(_2\) \cdot 6H\(_2\)O (6.96 mg, 0.0273 mmol) in MeOH (10 mL) was added to the above solution. The mixture was stirred for a day under nitrogen atmosphere. Afterwards, the solvent was evaporated on a rotary evaporator in air. The residue was washed with diisopropyl ether (20 mL × 1) and dried in vacuum to get a yellow color powder of 1. Yield 30 mg. Raman (488 nm Ar\(^+\) laser; ν in cm\(^{-1}\)) 847, 994, 1202, 1290, 1459 and 1610. UV/Vis (DCM/MeOH, M\(^{-1}\)cm\(^{-1}\)) 347 nm, 285 nm, 263 nm, 230 nm. FTIR (KBr disk; ν in cm\(^{-1}\)) 2959, 2921, 2860, 1737, 1463.
UV–vis and fluorescence titration spectra of ligand L with Fe$^{II}$(ClO$_4$)$_2$:

**Figure S1.** UV–vis and fluorescence titration spectra of ligand L with Fe$^{II}$(ClO$_4$)$_2$ in dichloromethane/MeOH at 25 °C. Arrows indicate the spectral changes with increasing amounts of Fe(II) ions.

**Micro-Raman image of isotopic pattern:**

**Figure S2.** a) Confocal image of isotopic nano-tapes fabricated from coordination polymer 1.b) Corresponding Raman image of the marked area shown by red line in fig (a). c, d) Raman image of the corresponding red line profile shown in (b) and (c) respectively.
SEM & AFM images of PDMS molds:

Figure S3. (a) SEM images of (a, b) Rectangular pattern, (c) Non contact mode AFM images of (a) Rectangular pattern, (d) Topographic profile of the mould, and (e) 3-D image of the mould.

Tapping mode AFM image of isotopic fiber on mica surface:

Figure S4. a) AFM image of the isotopic complex polymer nano-tapes grown by slow evaporation of DCM on mica surface, (b) AFM 3-D image, (c) topography along the white line.
Confocal image of anisotropic aligned nano-tape bundles:

Figure S5. Confocal image of aligned nano-tape bundles, scale bar (a) 60 μm, (b) 30 μm, (c) 10 μm.

References:
