Prof. Dr. Donglin Jiang

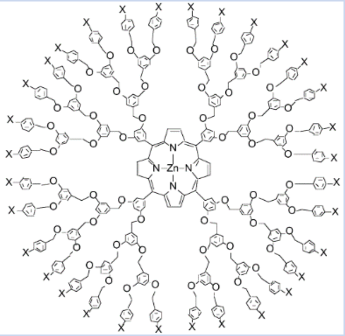
Professor at National University of Singapore

- 1989 BSc (Prof. Zhiquan Shen) ZJU, China
- 1989–1998 PhD & Postdoc (Prof. Takuzo Aida) UTokyo, Japan
- 1998–2000 Assistant Professor (AIDA Laboratory) UTokyo, Japan
- 2000–2005 Group Leader at AIDA Nanospace Project JST ERATO, Japan
- 2005–2015 Associate Professor at IMS, NINS and SOKENDAI Ozakazi, Japan
- 2016–2018 Professor JAIST, Japan
- 2018–present Professor NUS, Singapore

1997: Young Scientist Fellowship, JSPS
2000: Lecture Award of Annual National Meeting, Chemical Society of Japan
2005: Young Lectureship Awards
2005: Principle Investigator of JST PRESTO
2006: SPSJ Wiley Award
2006: Young Scientist Prize, Japan
2017: 34^{th} Chemical Society of Japan Award for creative work

More than 180 scientific publications
h-index: 73 (Oct 2020)

Dendrimers

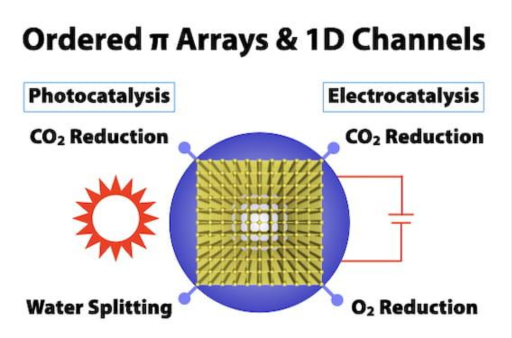


- Dendritic porphyrins as haemoprotein mimics
- Light-harvesting dendrimers for photodynamic therapy

Conjugated microporous polymers (CMPs)

- Deployment of thin films via electropolymerization
- label-free chemo- and biosensing

Covalent Organic Frameworks (COFs) as photocatalytic/electrocatalytic systems

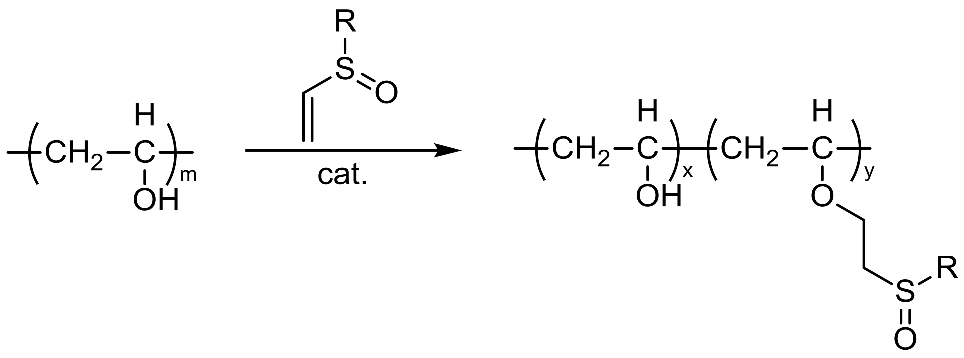


- Electrocatalytic CO_2 reduction
- Photocatalytic O_2 activation

COFs as stable and highly tunable systems for functional materials

- Application for sensing, separation of molecules and removal of pollutants

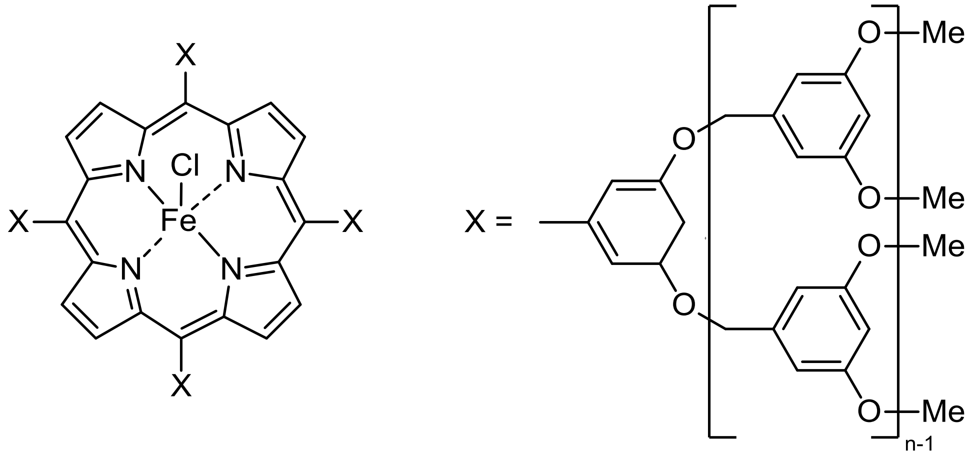
Gas Permeability of Sulfoxide-grafted Polyvinylalcohol



R = Me, Et, Pr, *t*-Bu, Ph

Chinese J. Polym. Sci. **1994**, *12*, 132–136

Dentritic iron porphyrin as haemoprotein mimic

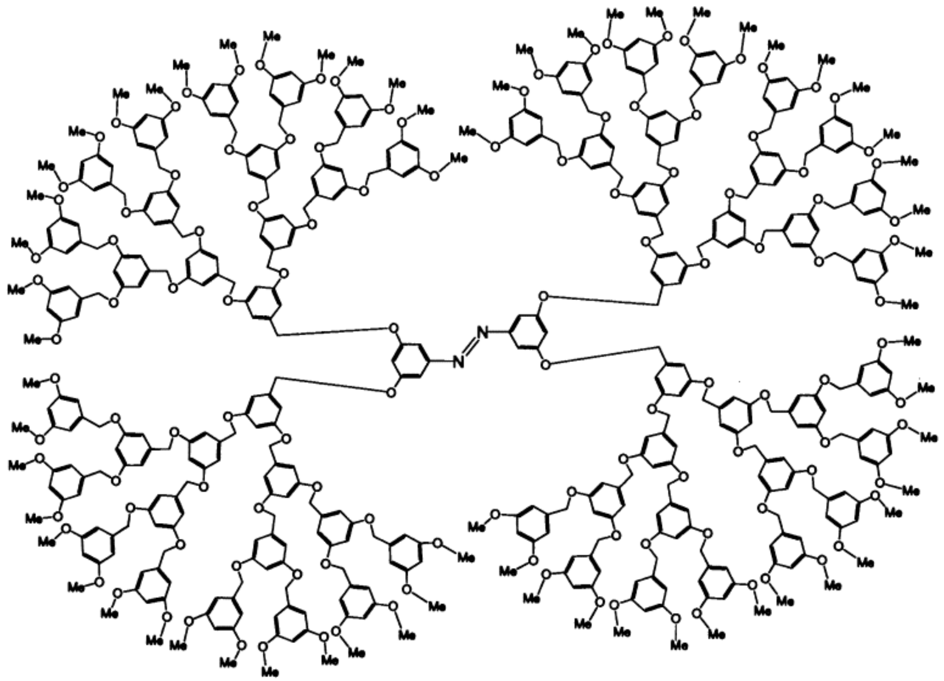


$Fe^{III}L^{n}Cl$ (n = 1, 3-5)

Chem. Commun. **1996**, 1523–1524

For $Fe^{III}(min)_2L^5$ reversible O_2-binding activity with half-life of 50 h upon CO exposure

Light-harvesting with dendritic antenna



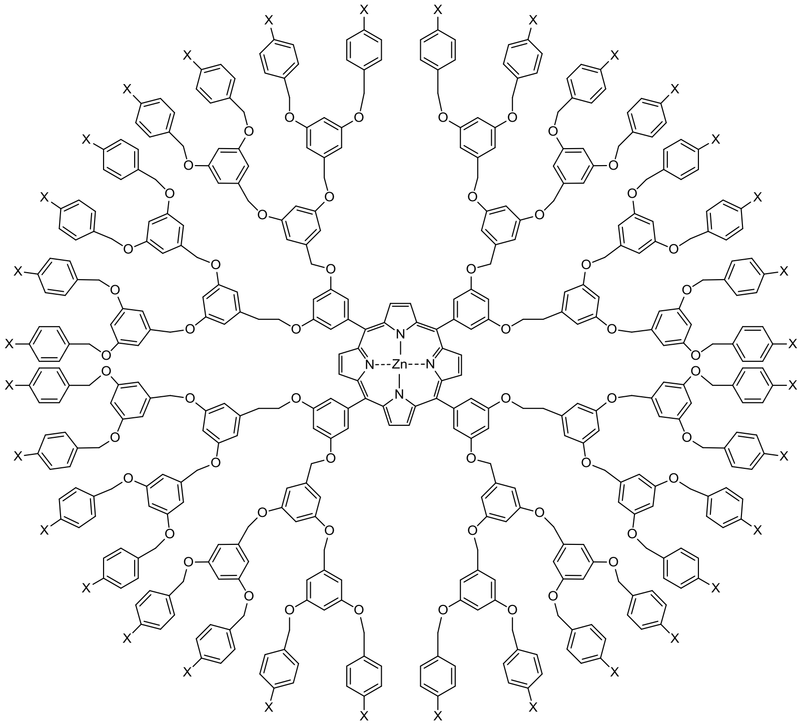
Thin Solid Films **1998**, *331*, 254–258

IR-excitations for dendrimers with aromatic layers ≥ 4 lead to *cis*/*trans* isomerization

First Independent Works as Group Leader

D. Jiang

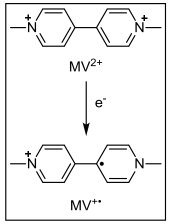
Light-Harvesting Ionic Dendrimer Porphyrins for Photodynamic Therapy

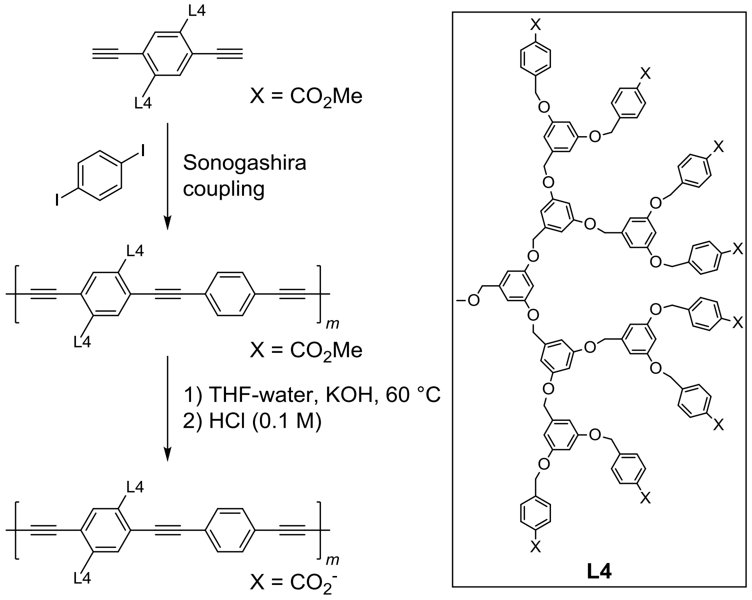


Bioconjugate Chem. **2003**, *14*, 58–66

$^1O_2$-induced cytotoxicity against LLC cells more selective than other porphyrin based photosensitizers

Photosensitized Hydrogen Evolution from Water



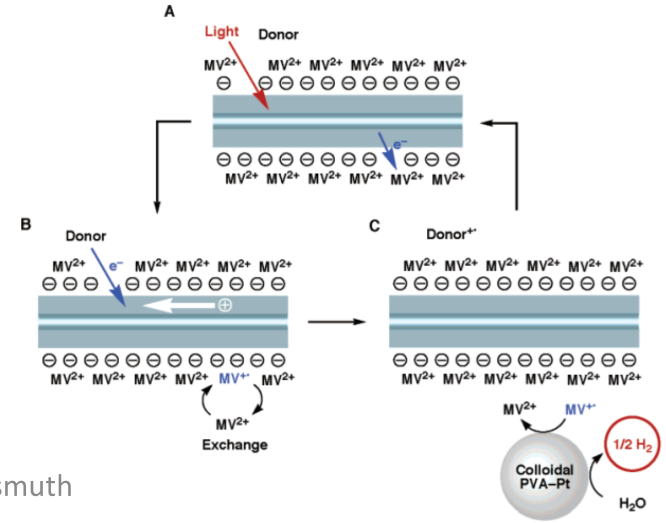


A) MV^{2+} attracted to dendrimeric surface (one-electron reduction)

B) $MV^{+\bullet}$ exchanged by MV^{2+}

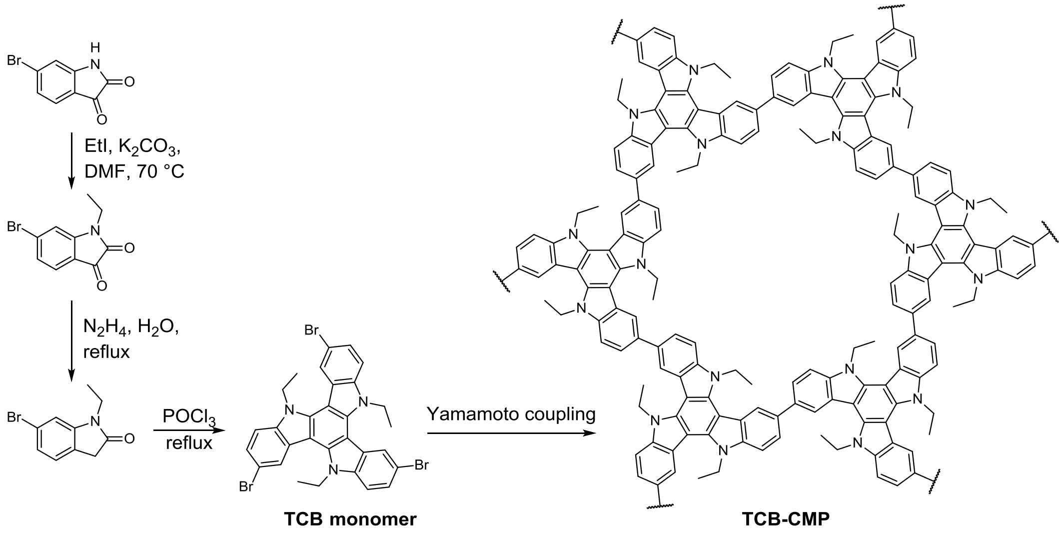
C) $MV^{+\bullet}$ reduces H_2O

J. Am. Chem. Soc. **2004**, *126*, 12084–12089



$$2\,MV^{+\bullet} + H_2O \xrightarrow{\text{col. Pt}} H_2 + OH^- + 2\,MV^{2+}$$

CMPs as Molecular Sensing Devices



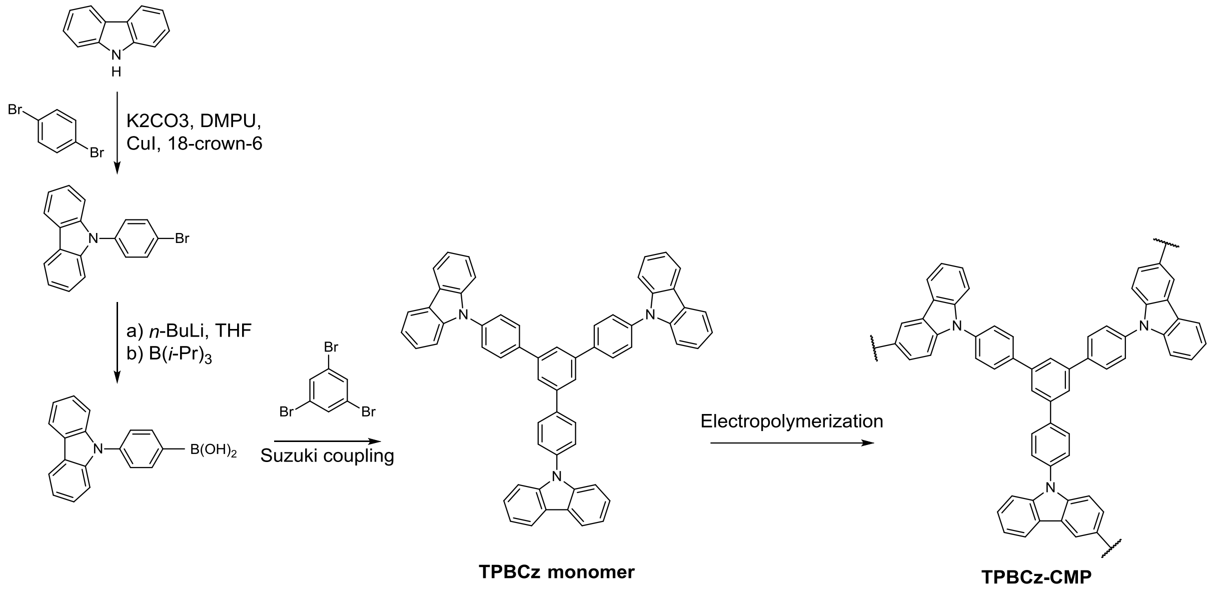
J. Am. Chem. Soc. **2012**, *134*, 8738–8741

Fluorescent CMP with Φ = 10%

electron-deficient arenes like DNT heavily quench the fluorescence of TCB-CMP

electron-rich arenes (Mesitylene, Toluene) enhance fluorescence intensity

Controlled Synthesis of CMPs

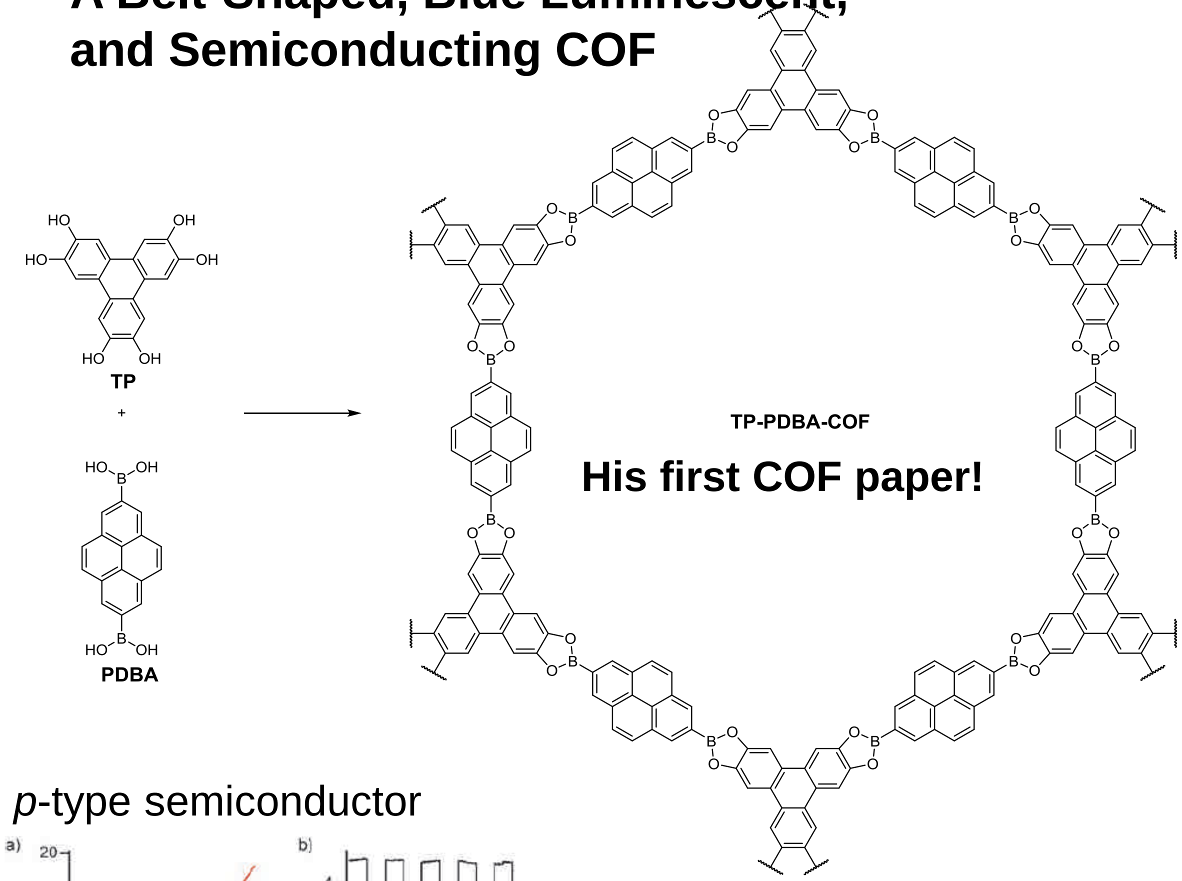


Angew. Chem. Int. Ed. **2014**, *53*, 4850–4855

TPBCz monomers are electrochemically oxidized which then can undergo coupling reaction

Similar sensing of arenes, high sensitivity for oxidative metal ions (Fe^{3+},Co^{3+}, Ag^{+}), Dopamine (10^{-8} M), HOCl (10^{-9} M)

A Belt-Shaped, Blue Luminescent, and Semiconducting COF



His first COF paper!

p-type semiconductor

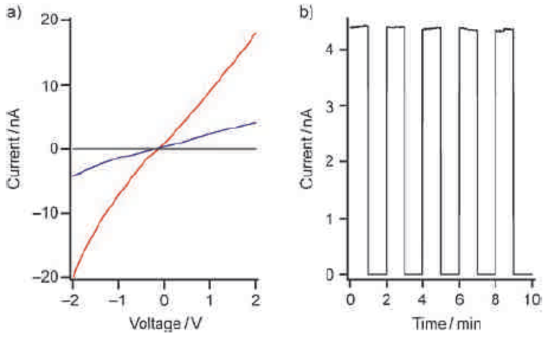
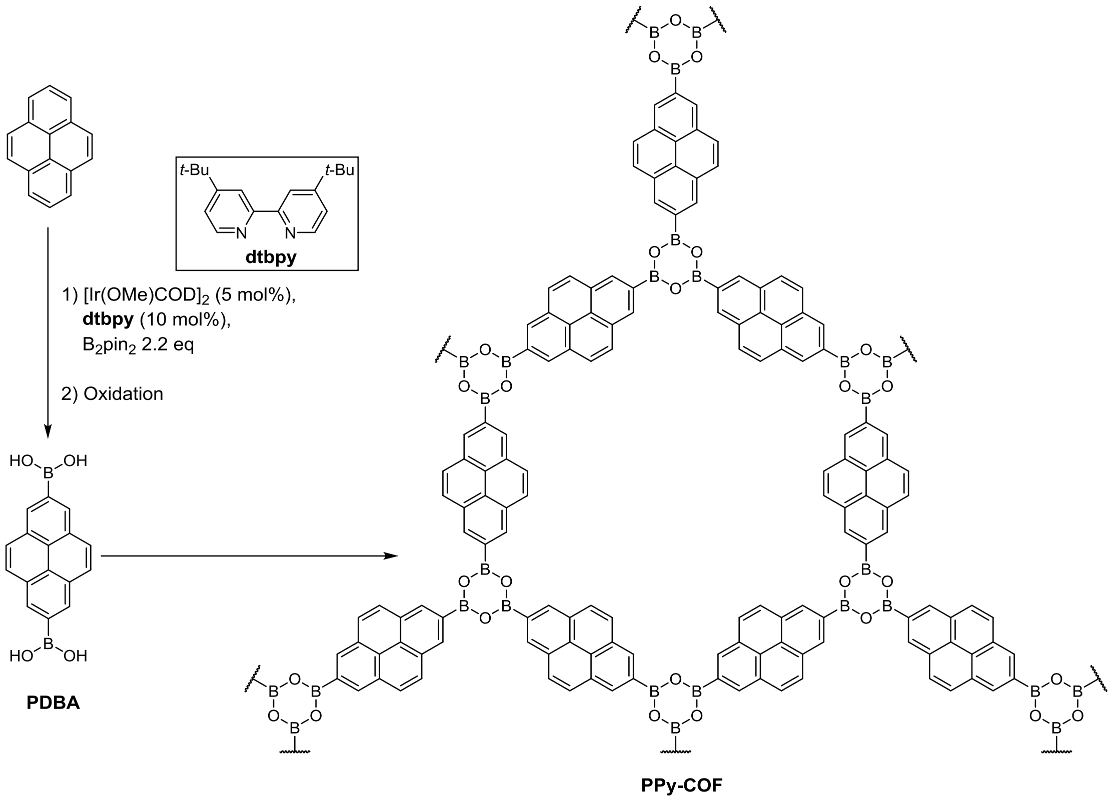


Figure 5. a) *I–V* profile of a 10 µm width Pt gap (black curve: without TP-COF; blue curve: with TP-COF; red curve: with iodine-doped TP-COF). b) Electric current when 2 V bias voltage is turned on or off.

Angew. Chem. Int. Ed. **2008**, *47*, 8826

- TP harvests wide range of photons
- singlet energy transfer to Py
- Py exhibits blue fluorescence

Self-condensed pyrenediboronic acid

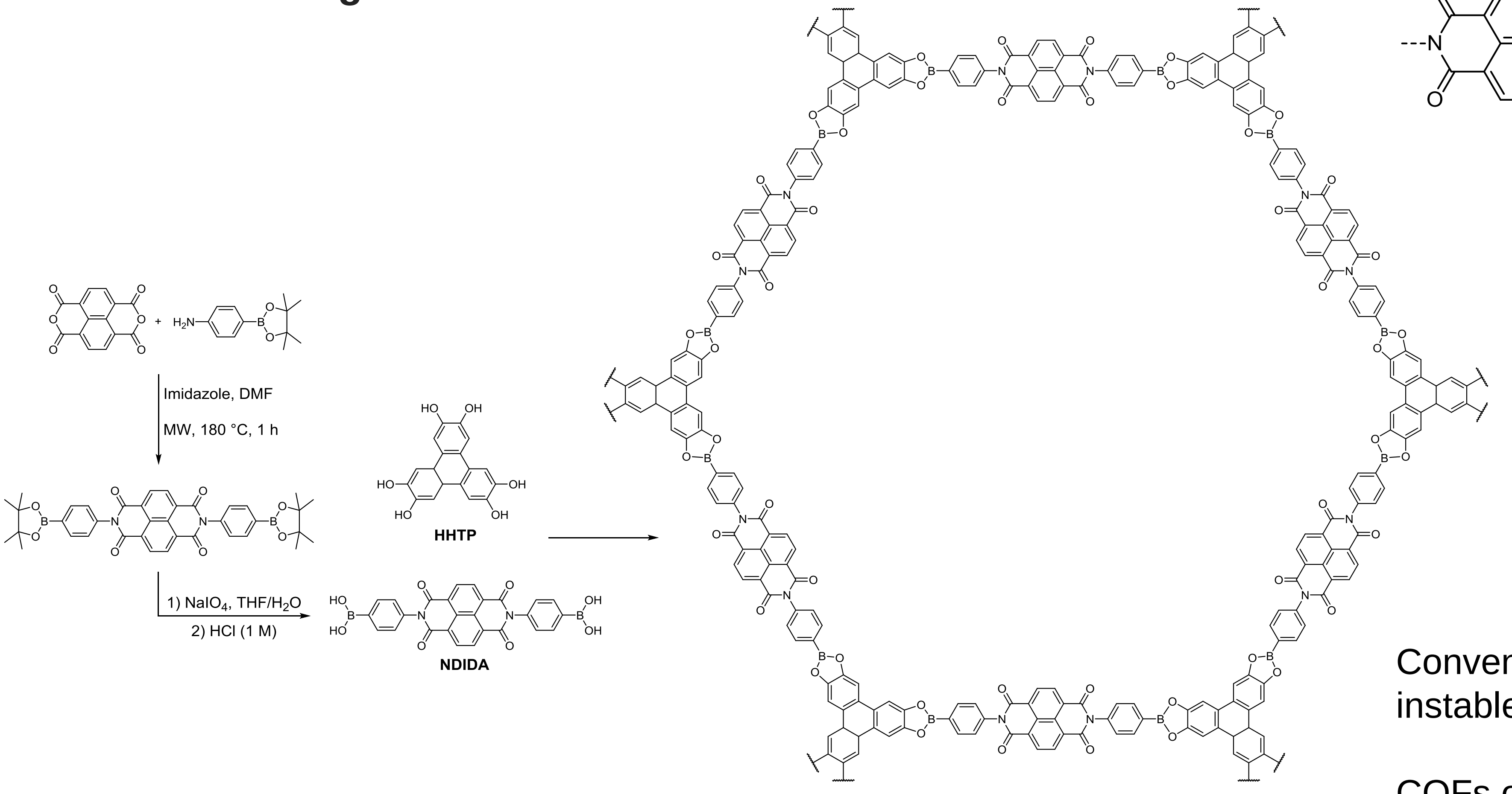


Angew. Chem. Int. Ed. **2009**, *48*, 5439–5442

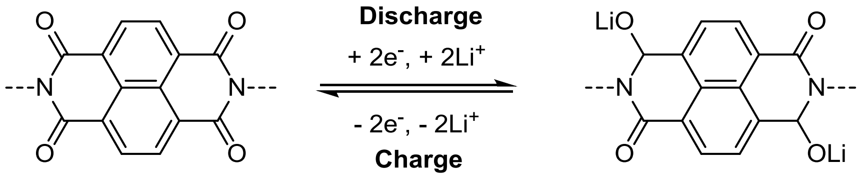
first example of photoconductive COF

- exciton migration facilitated, excitons flow unhindered over the sheet plane and across stacked layers
- harvests visible light photons (> 400 nm)

Electrochemically active COFs on carbon nanotubes for Li-ion storage



HHTP-NDIDA-COF



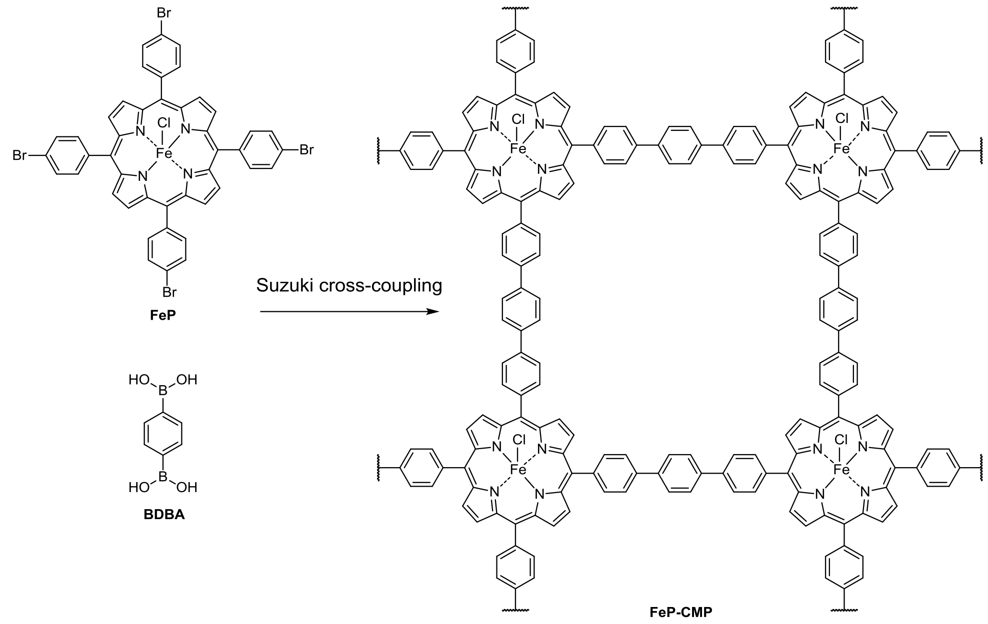
Sci. Rep. **2015**, *5*, 8225

Conventional organic electrode structurally instable, slow ion diffusion, poorly conductive

COFs on carbon nanotubes as electrode:

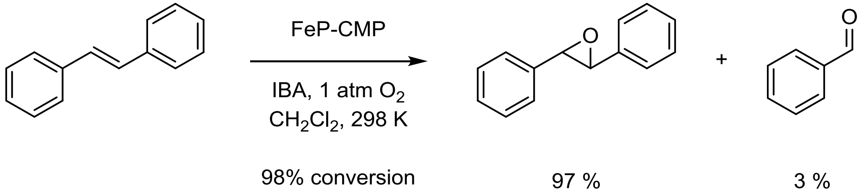
- Stable skeleton
- Open meso-channels for ion transport
- Carbon nanotubes wires boost conductivity

Metalloporphyrin CMPs as catalyst for epoxidation of olefins



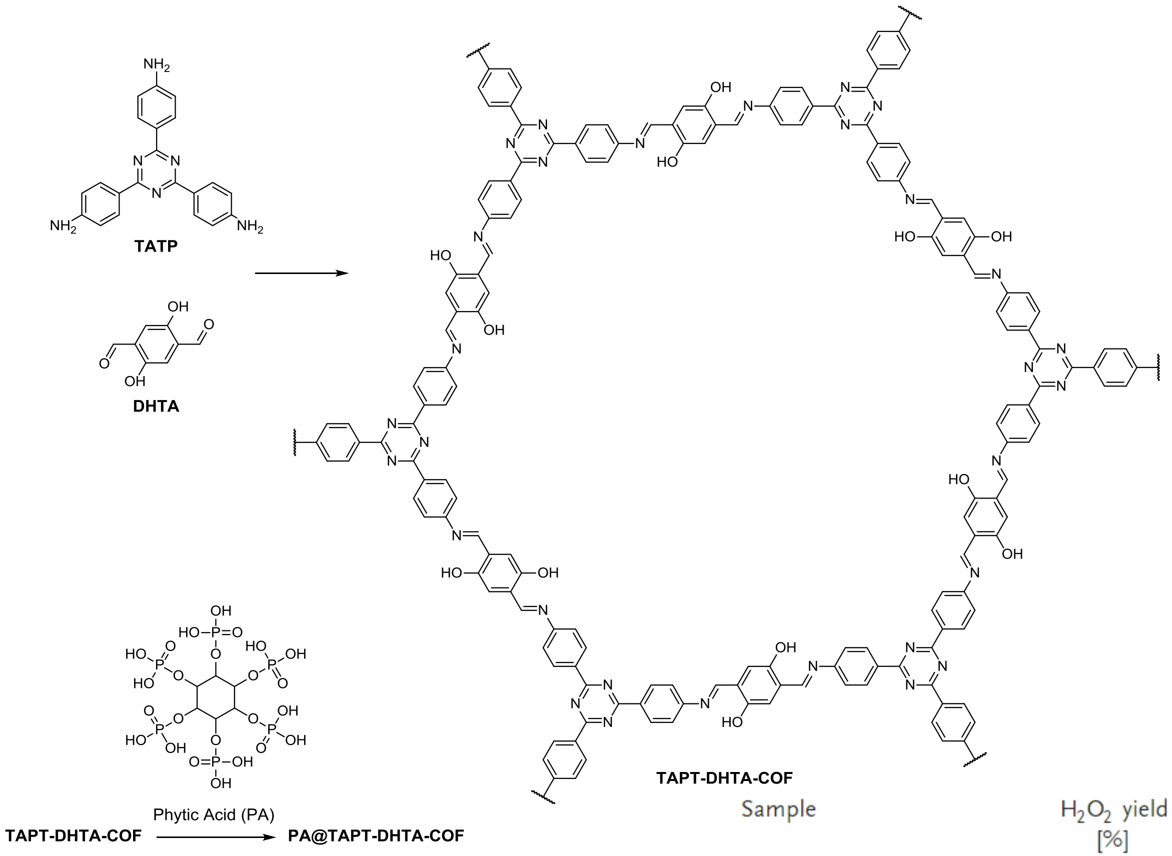
Adv. Mater. **2011**, *23*, 3149–3154

Catalyst for epoxidation of olefins

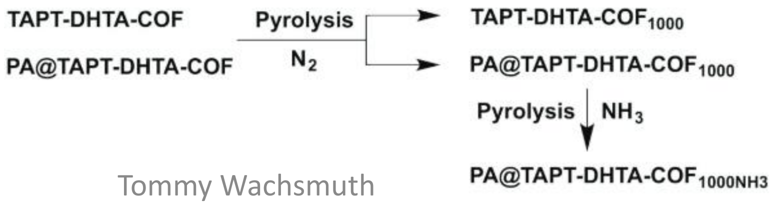


Applicable for wide scope of substrates

Template Conversion of COFs into 2D Conducting Nanocarbons for Catalyzing O_2 Reduction



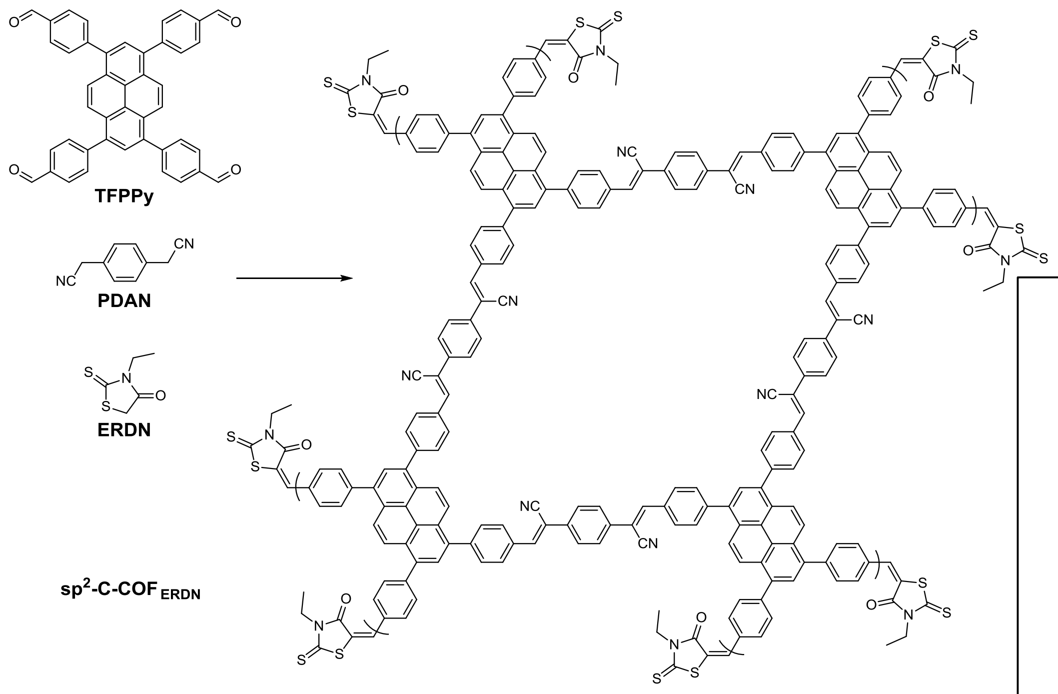
Adv. Mater. **2018**, *30*, 1706330

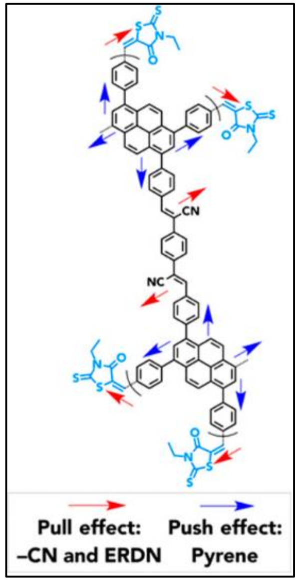


Sample	H_2O_2 yield [%]
TAPA–DHTA–COF	–
PA@TAPT–DHTA–COF	–
TAPT–DHTA–COF_{1000}	16–37
PA@TAPT–DHTA–COF_{1000}	12–20
PA@TAPT–DHTA–$COF_{1000NH3}$	1.5–11
Pt-C	1.3–12

Employment of COFs for catalytic systems

Engineering Covalent Organic Frameworks for Light-Driven Hydrogen Production from Water



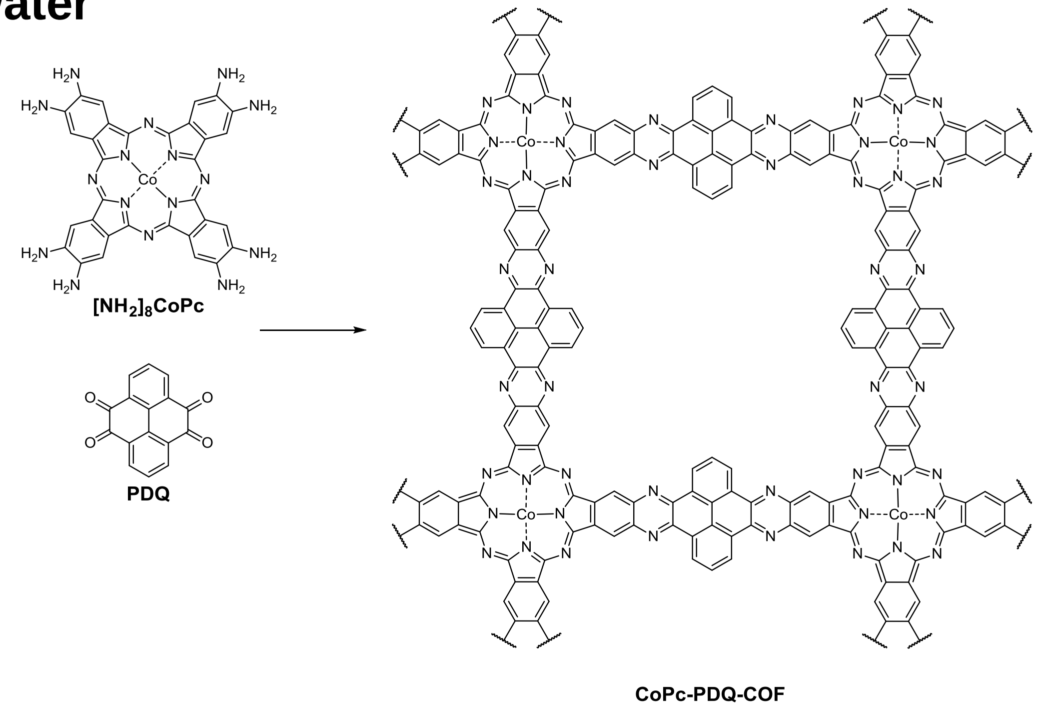


ACS Materials Lett. **2019**, *1*, 203–208

ERDN enhances π conjugation and decreases band gap to 1.85 *e*V
→ light-harvesting extended to 800 nm with lowered reduction and oxidation potential

H_2 production through deposited Pt nanoparticles (2120 μmol h^{-1} g^{-1})

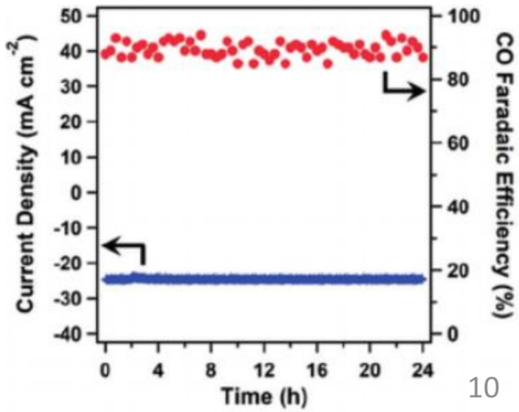
Metallophthalocyanine COF for CO_2 Reduction in Water



Angew. Chem. Int. Ed. **2020**, *59*, 16587–16593

Faradaic effiency of 96% for reduction of CO_2 in water

TON up to 320 000
TOF of 11 412 h^{-1}



Mercury Removal from Aqueous Solutions

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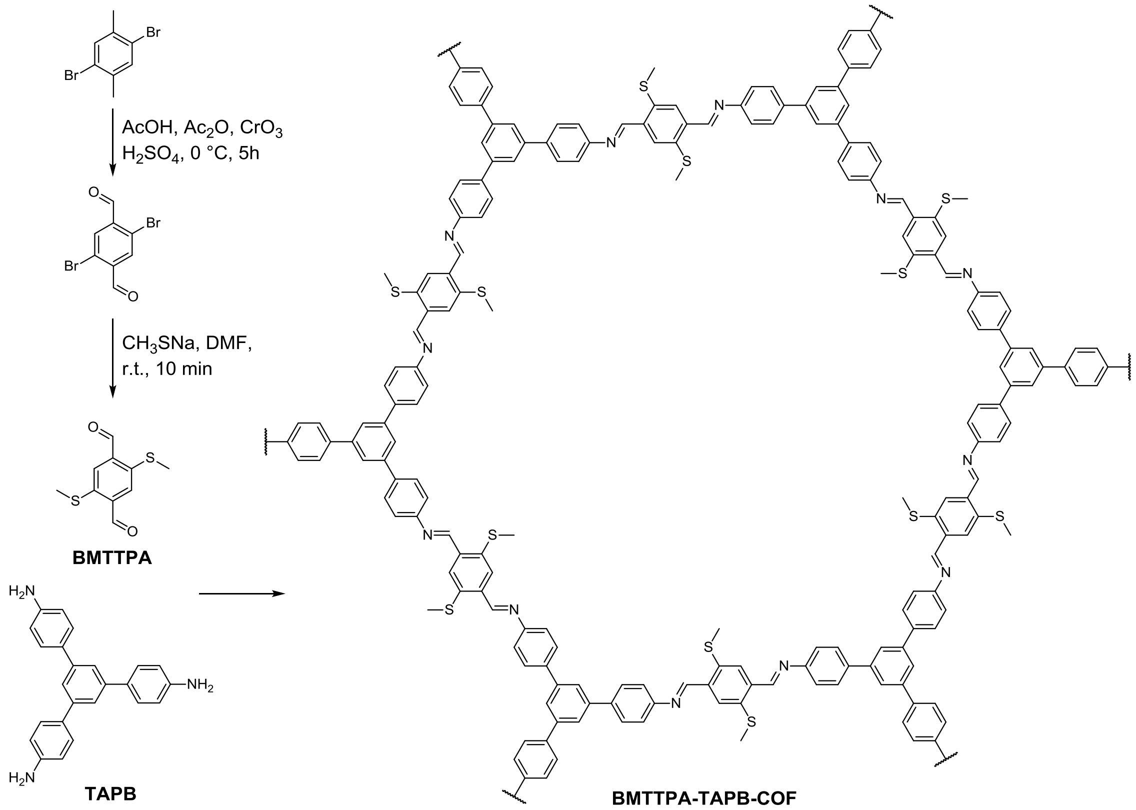
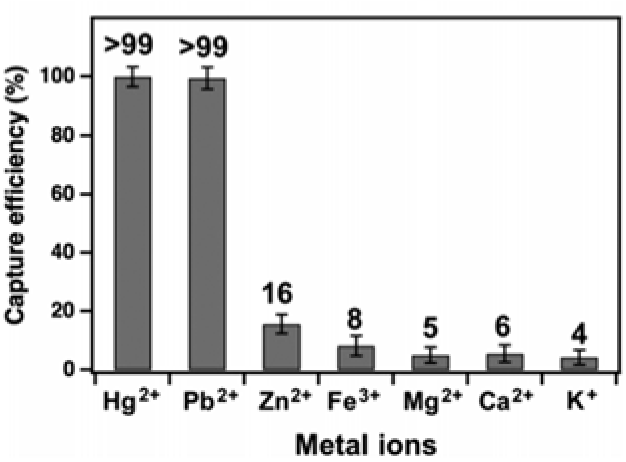


J. Am. Chem. Soc. **2017**, *139*, 2428–2434

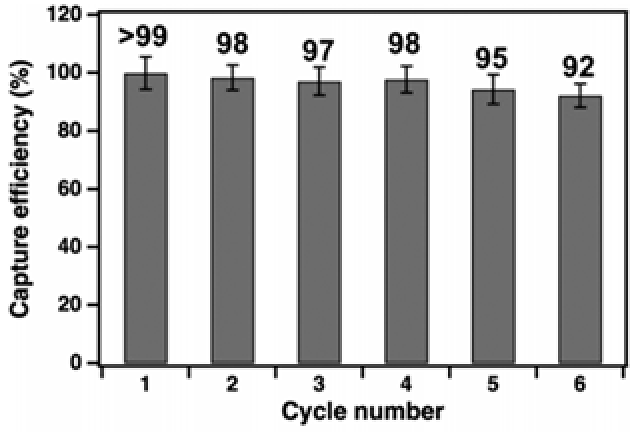


Hg contamination reduced from 10 ppm to ~0.02 ppm within minutes

Hg(II)-removal capacity of 734 mg g^{-1}

Stable and functional under harsh acidic conditions unlike common silica- or MOF-based adsorbents

Easily recyclable by rinsing with HCl (6 M)



Molecular Recognition and Separation in 1D Nanochannels

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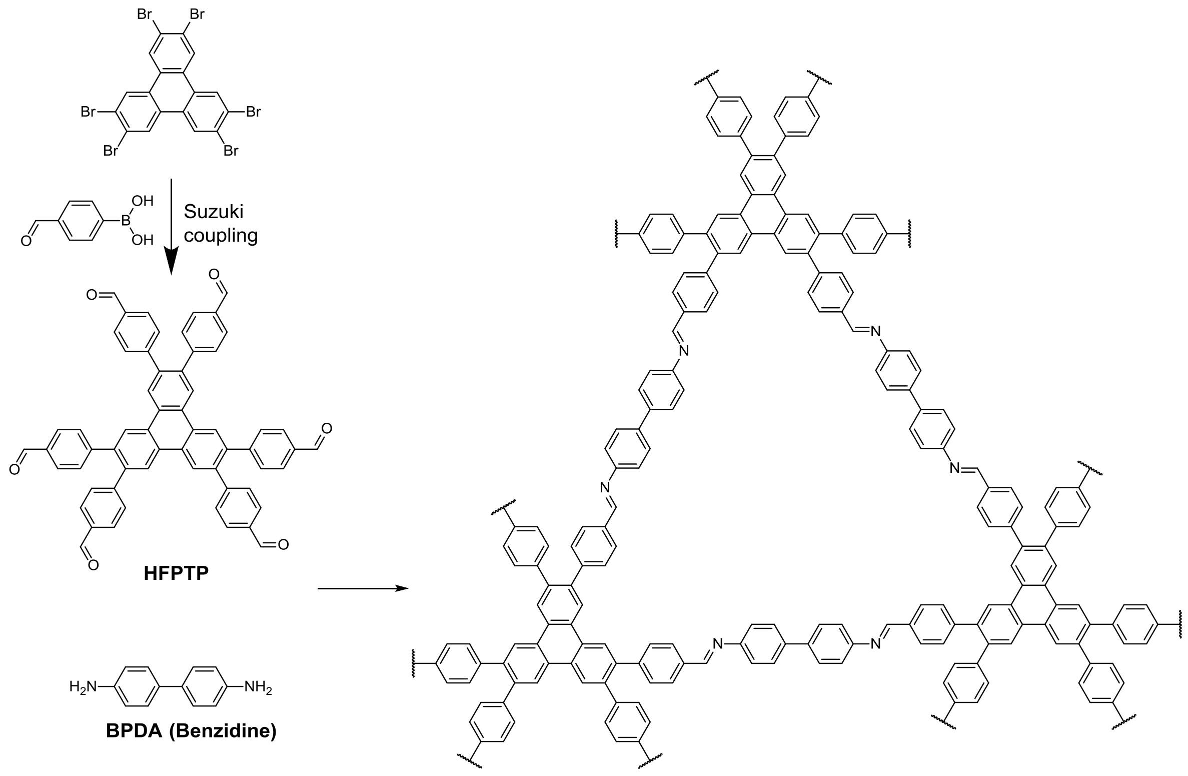
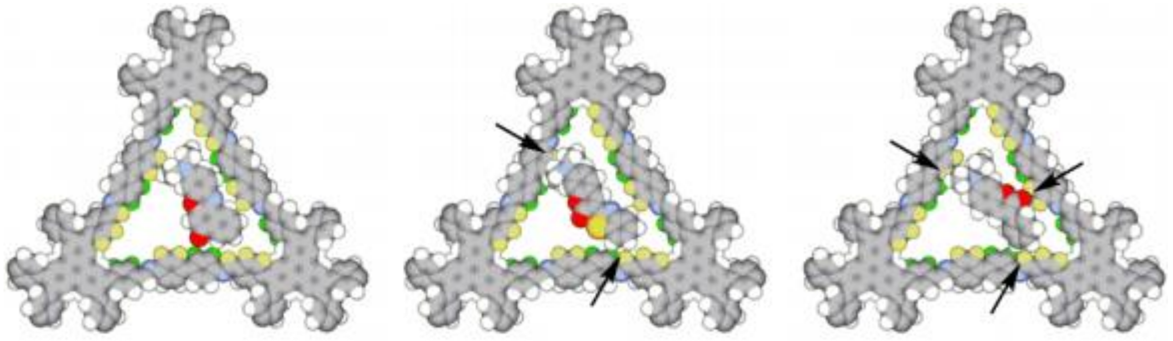
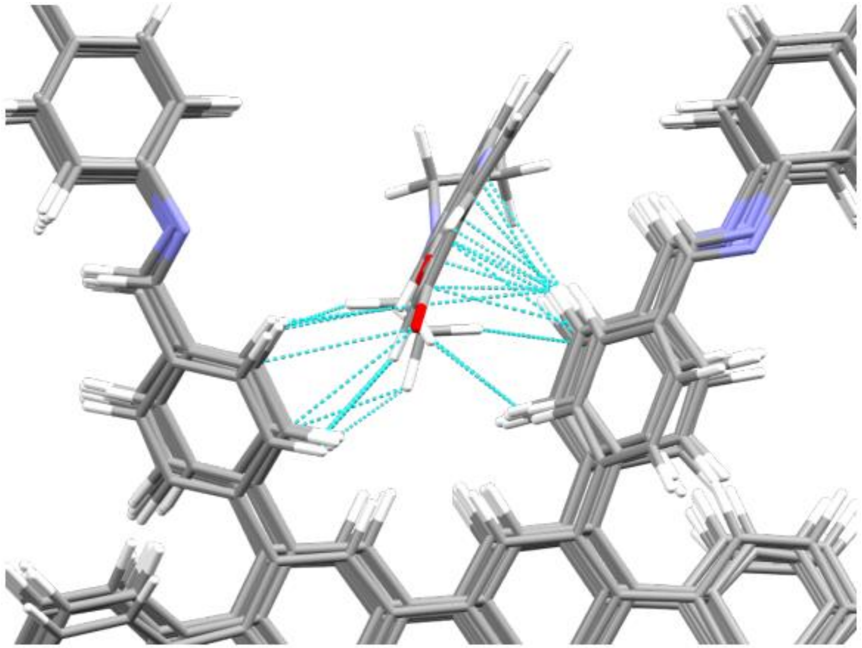


Angew. Chem. Int. Ed. **2019**, *58*, 15922–15927

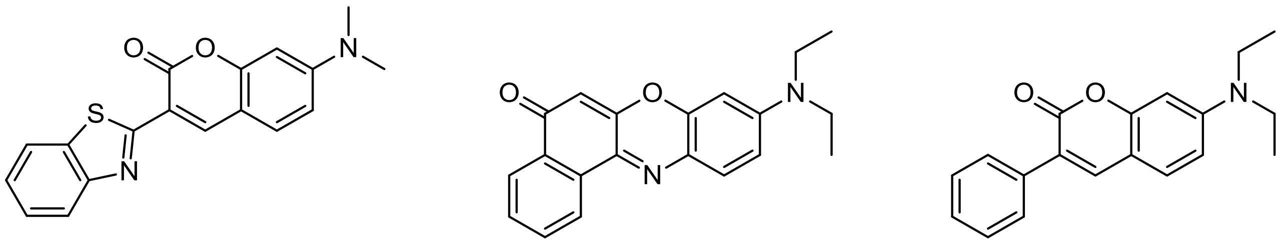


NR C6 DAPC

Binding of NR in the 1D channels via 9 close C–H···π interactions & attractive London disperse forces



Highly selective separation of NR/C6 and NR/DAPC mixtures



Coumarin 6 (C6) Nile red (NR) DAPC

Tommy Wachsmuth

The Jiang Laboratory 2019