Supporting Information for

Multifunctional Polyhedral Oligomeric Silsesquioxane (POSS) Based Hybrid Porous Materials for CO_2 Uptake and Iodine Adsoprtion

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Characterization

FTIR spectra were recorded using a Bruker Tensor 27 FTIR spectrophotometer and the conventional KBr disk method; 32 scans were collected at a spectral resolution of 4 cm^{-1}. The films used in this study were sufficiently thin to obey the Beer-Lambert law. Wide-Angle X-ray diffraction (WAXD) pattern was obscured from the wiggler beamline BL17A1 of the National Synchrotron Radiation Research Center (NSRRC), Taiwan. A triangular bent Si (111) single crystal was used to obtain a monochromated beam having a wavelength (λ) of 1.33 Å. Cross-polarization with MAS (CP/MAS) was used to acquire ^{13}C NMR spectral data at 75.5 MHz. The CP contact time was 2 ms; $_1H$ decoupling was applied during data acquisition. The decoupling frequency corresponded to 32 kHz. The MAS sample spinning rate was 10 kHz. Transmission electron microscope (TEM) images were obtained with a JEOL JEM-2010 instrument operated at 200 kV. Field emission scanning electron microscopy (FE-SEM) was conducted using a JEOL JSM7610F scanning electron microscope. Samples were treated via Pt sputtering for 100 s before observation. BET surface area and porosimetry measurements of the prepared samples (ca. 40-100 mg) were performed using a BEL. Nitrogen isotherms were generated through incremental exposure to ultrahigh-purity N_2 (up to ca. 1 atm) in a liquid nitrogen (77 K) bath. Surface parameters were determined using BET adsorption models in the instrument's software. TGA was performed using a TA Q-50 analyzer under a flow of N_2 atmosphere. The samples were sealed in a Pt cell and heated from 40 to 800 °C at a heating rate of 20 °C min^{-1} under a flow of N_2 atmosphere at a flow rate of 60 mL min^{-1}.UV–Vis spectra were recorded at 25 °C using a Jasco V-570 spectrometer, with deionized water as the solvent.

Table S1: Performance data of POSS-TPP and POSS-TPE compared with those of other previously porous materials.

Samples	**CO_2 uptake (mmole/g)**		**Ref**
	298 K	273 K	
PDMTPAS	1.02	1.76	[1]
PDPTPAS	1.04	1.76	[1]
An-HPP	0.52	1.29	[2]
TPT-HPP	0.90	1.99	[2]
Car-HPP	1.24	2.29	[2]
TPE-HPP	0.85	1.49	[2]
HPP-1c	0.86	1.56	[3]
LHPP-3	0.77	1.44	[4]
HPP-3	-	1.42	[5]
THPP	-	1.16	[6]
PHAP-1		2.60	[7]
PECONF-4		0.14	[8]
POSS-TPP	1.63	2.88	This work
POSS-TPE	0.99	1.97	This work

Table S2. Iodine uptake properties of POSS-TPP, POSS-TPE and other porous materials.

Sample	Surface area (m^2/g)	Iodine uptake (mg/g)	Ref
Activated carbon	-	300	[9]
CC3	-	364	[10]
NOP-54	1187	202	[11]
ZIF-8	1875	1200	[12]
Ag@Mon-MOF	690	250	[13]
Ag@Zeolite Mordenities	-	275	[14]
HCMP-3	82	3160	[15]
PAF-1	2081	1860	[16]
TTPT	315.5	1770	[17]
pha-HCOPs	217.31	1310	[18]
POSS-TPP	270	363	This work
POSS-TPE	741	309	This work

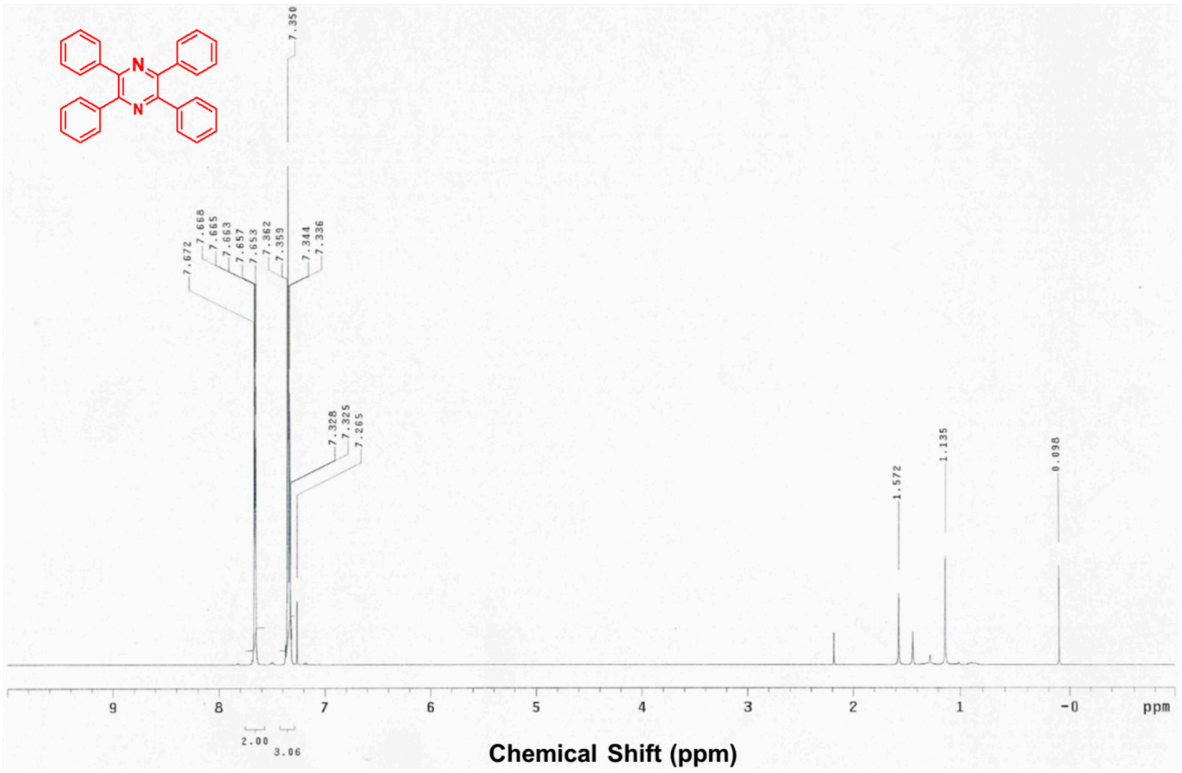

Figure S1. ^{1}H NMR spectrum of TPP.

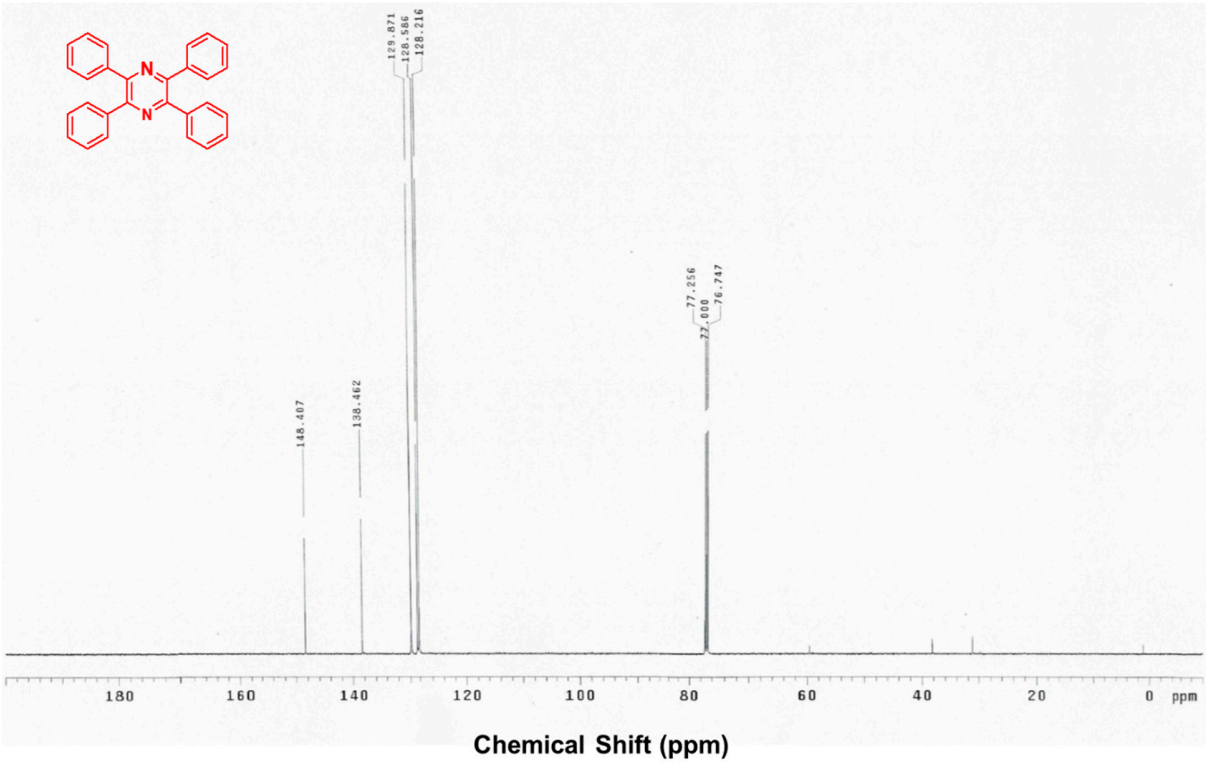

Figure S2. ^{13}C NMR spectrum of TPP.

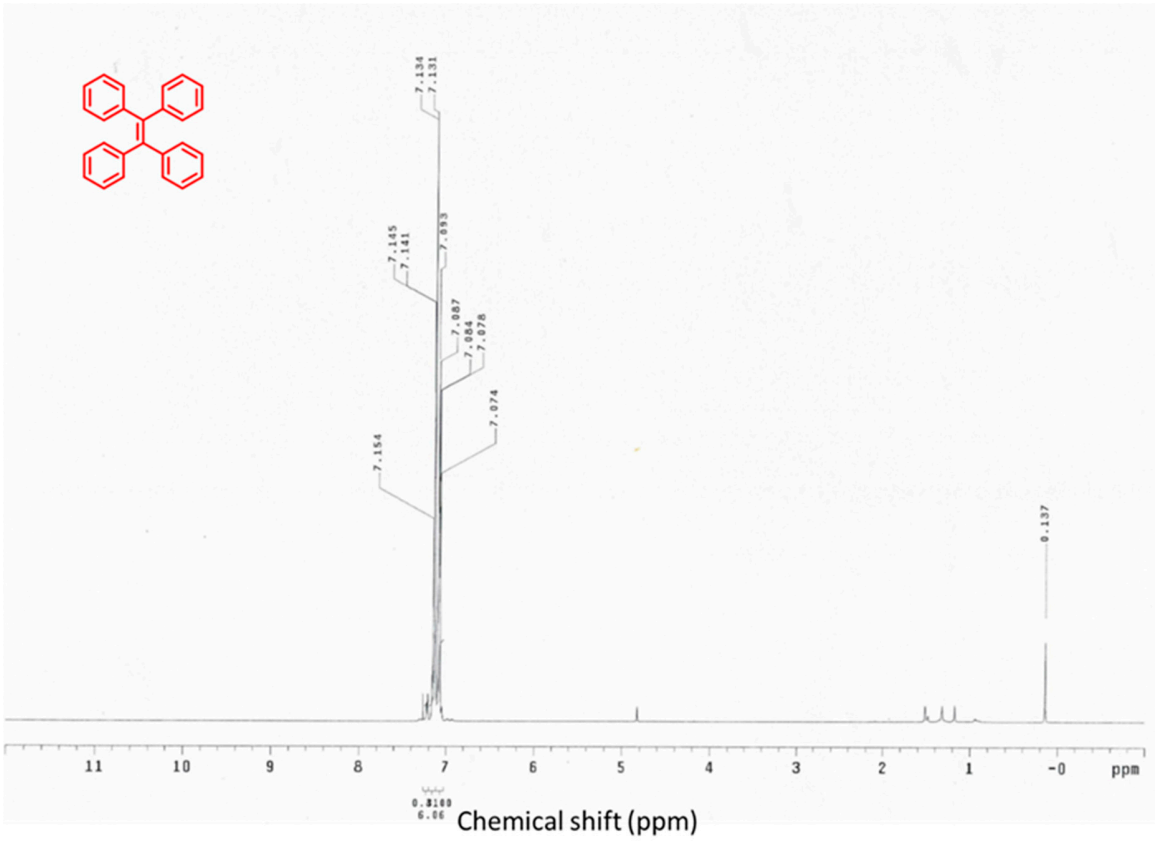

Figure S3. ^{1}H NMR spectrum of TPE.

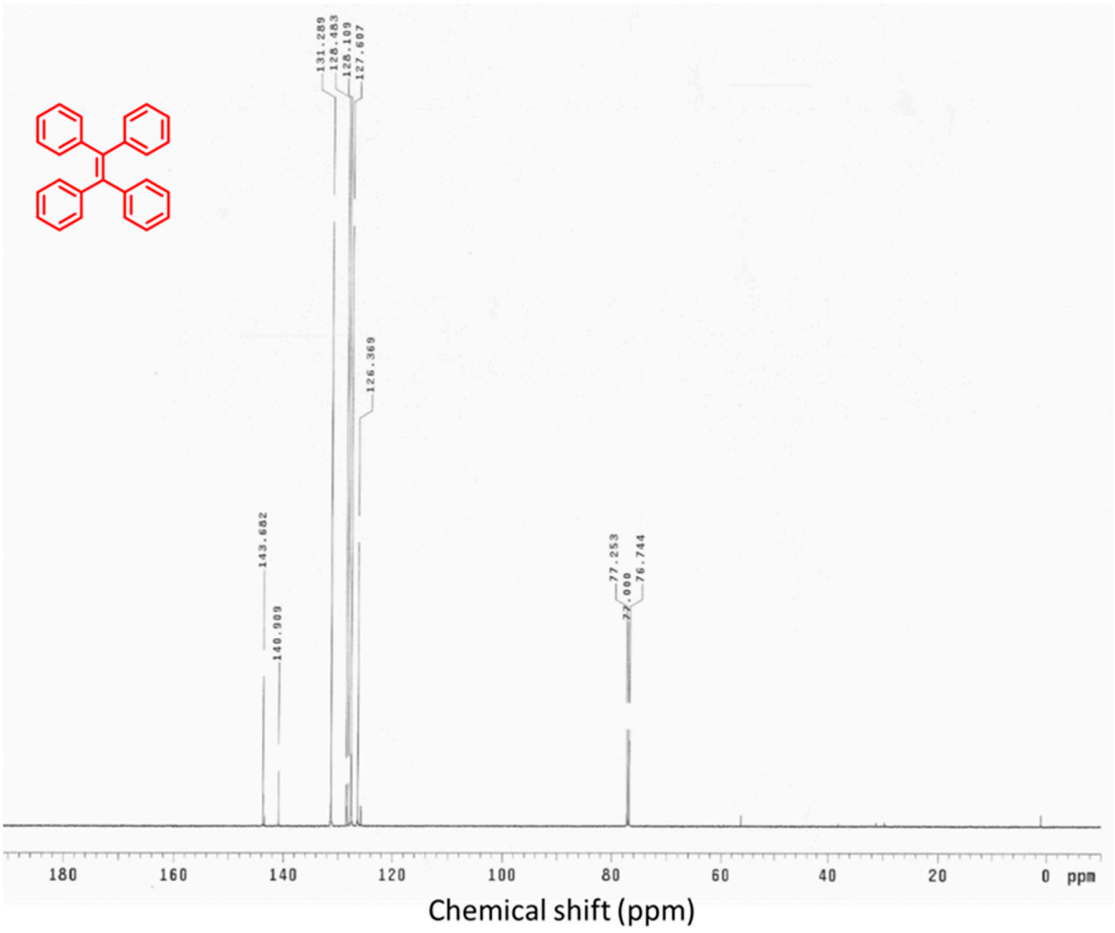

Figure S4. ^{13}C NMR spectrum of TPE.

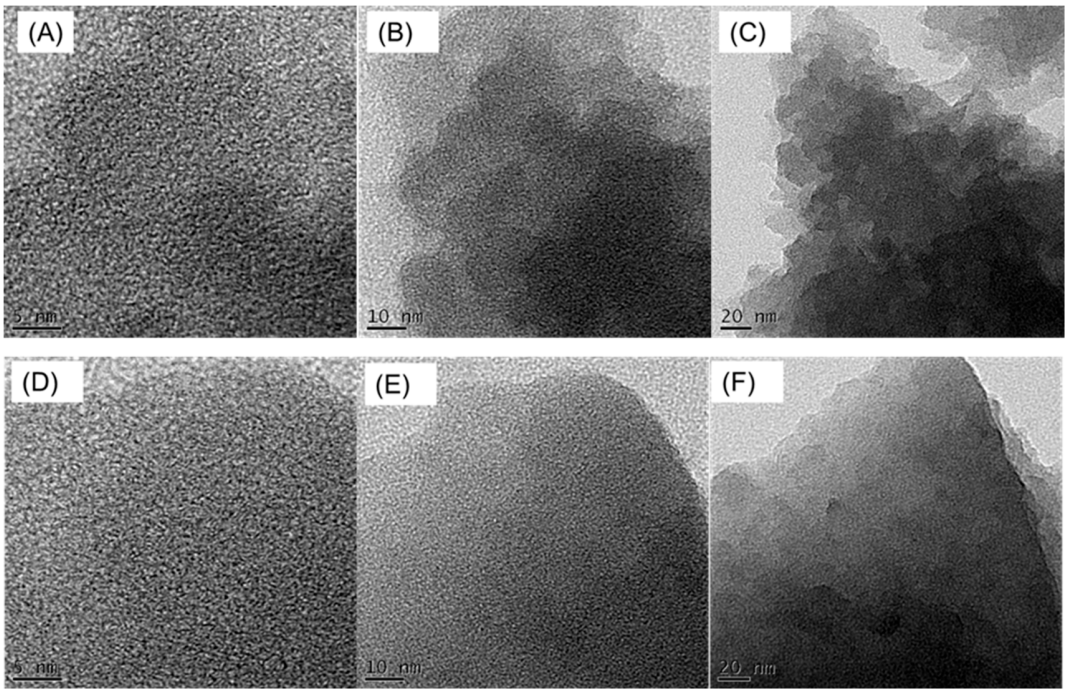

Figure S5. TEM images of POSS-TPP (A, B, C) and POSS-TPE (D, E, F).

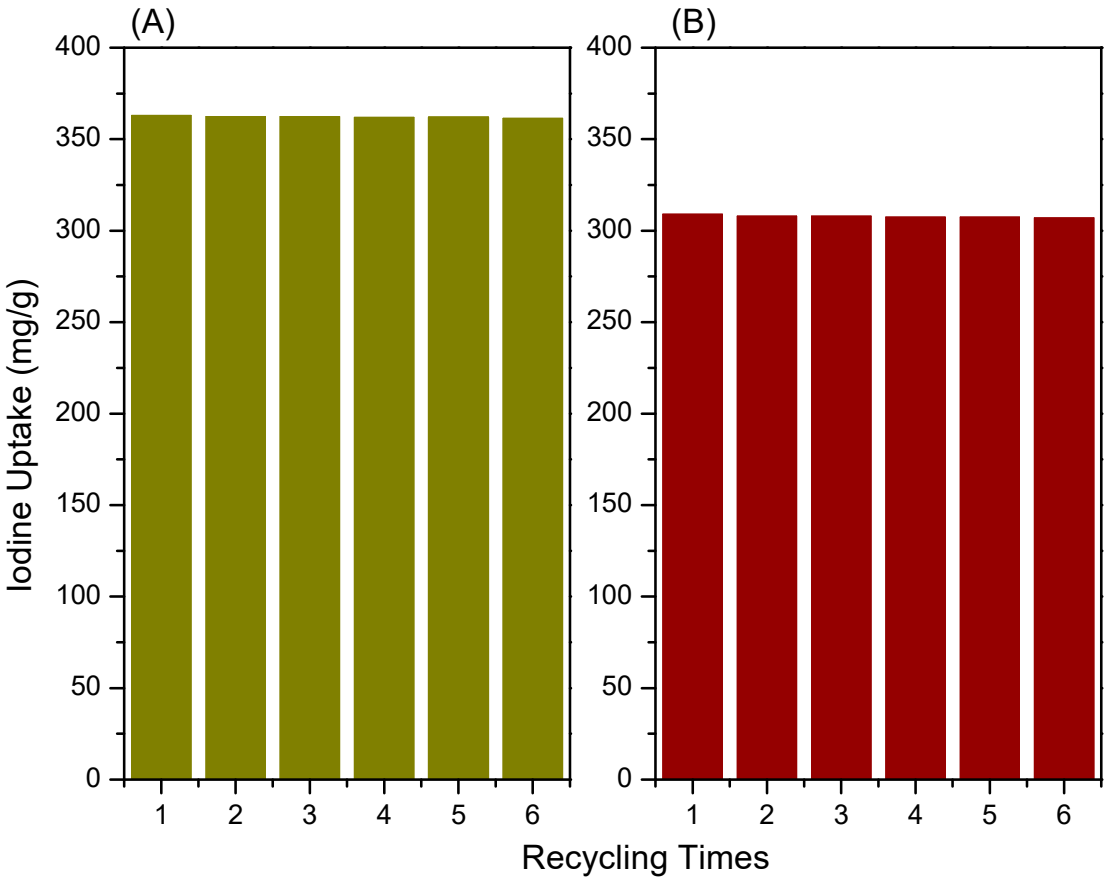

Figure S6. Repeated I_2 uptake experiments for (A) POSS-TPP and (B) POSS-TPE.

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