

Supporting Information:

Synthesis of Polyaniline (PANI)

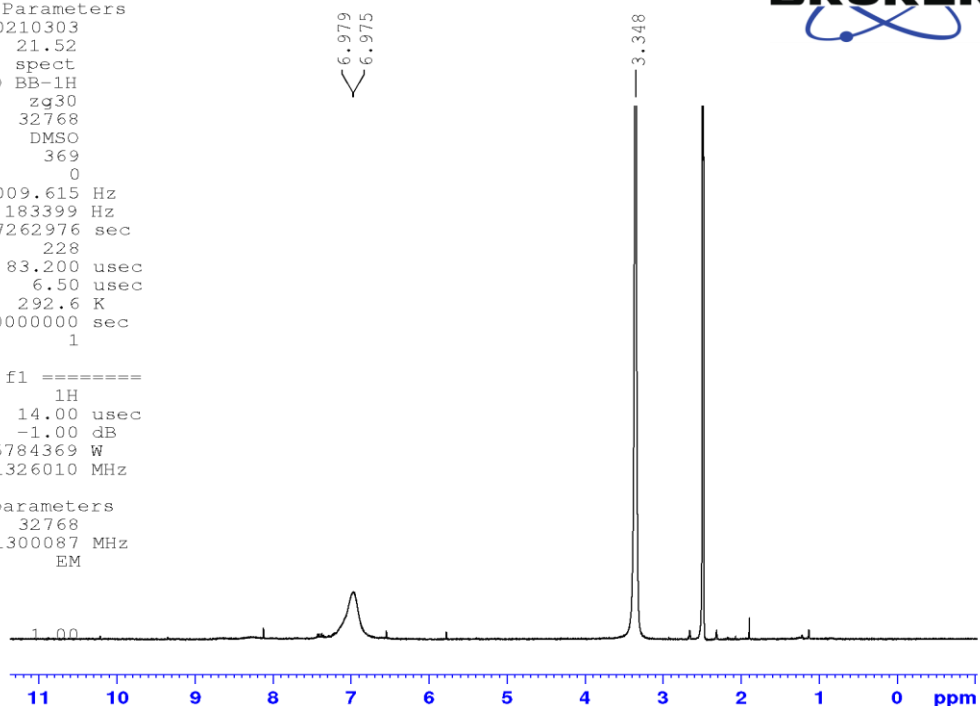
PANI was typically synthesized by oxidative chemical polymerization using equimolar quantity of aniline and ammonium persulphate (APS) in 1.0 M HCl aqueous solution. The reaction was performed in an ice bath with drop-wise addition of APS into aniline monomer solution. And then, it was stirred for 4 hours followed by vacuum filtration. The PANI-emeraldine salt thus obtained washed with 1.0 M HCl and distilled water. Subsequently, PANI was de-doped with 1.0 M ammonium hydroxide solution for further 12 hours under magnetic stirring to produce emeraldine base (EB) form of PANI. Afterwards, the EB form of PANI was filtered, washed with DI water and dried under vacuum for 24 hours. The typical yield of obtained EB form of PANI was calculated at ~ 35%.

Current Data Parameters
NAME 20210302-PANI-0.01g ok
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20210303
Time 21.52
INSTRUM spect
PROBHD 5 mm BBO BB-1H
PULPROG zg30
TD 32768
SOLVENT DMSO
NS 369
DS 0
SWH 6009.615 Hz
FIDRES 0.183399 Hz
AQ 2.7262976 sec
RG 228
DW 83.200 usec
DE 6.50 usec
TE 292.6 K
D1 1.50000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 14.00 usec
PL1 -1.00 dB
PL1W 7.55784369 W
SFO1 400.1326010 MHz

F2 - Processing parameters
SI 32768
SF 400.130087 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC



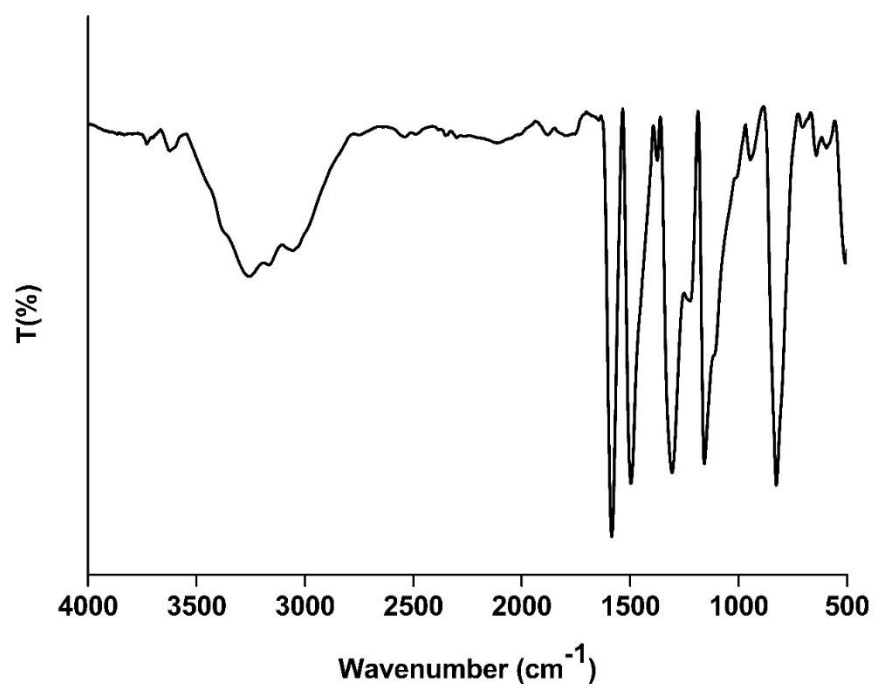


Fig. S1 The representative spectrum of (a) ^1H -NMR and (b) FTIR of PANI

Table S1. Quick response(s) and recovery time data of PANI (a) PANI-CA-1 (b) PANI-CA-3 (c) sensor as normalized current (I/I_0) to the concentration ranging from 1 to 50 ppm flowed through the measuring chamber (1000 sccm, $V = +0.1$ V) at 60% RH.

Response time (s):

| <i>Material</i> <i>Name</i> | <i>1</i> <i>ppm</i> | <i>5 ppm</i> | <i>10 ppm</i> | <i>20 ppm</i> | <i>30 ppm</i> | <i>40 ppm</i> | <i>50 ppm</i> |
|--------------------------------|------------------------|--------------|---------------|---------------|---------------|---------------|---------------|
| PANI | 108 | 50 | 30 | 15 | 9 | 5 | 1 |
| PANI-CA-1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| PANI-CA-3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Recovery time (min):

| Material Name | 1 ppm | 5 ppm | 10 ppm | 20 ppm | 30 ppm | 40 ppm | 50 ppm |
|--------------------------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|
| PANI | 5.25 | 11 | 12.5 | 13.25 | 14.75 | 15.25 | 16.25 |
| PANI-CA-1 | 2.25 | 7.75 | 10.25 | 12.25 | 13.75 | 15.25 | 17.75 |
| PANI-CA-3 | 8.5 | 10 | 13 | 13.75 | 15 | 15.25 | 16.75 |

Table S2. Quick response(s) and recovery time data of PANI (a) PANI-CA-1 (b) PANI-CA-3 (c) sensor as normalized current (I/I_0) to the concentration ranging from 1 to 50 ppm flowed through the measuring chamber (1000 sccm, $V = +0.1$ V) at 80% RH

Response time (s):

| <i>Material</i> <i>Name</i> | <i>1</i> <i>ppm</i> | <i>5 ppm</i> | <i>10 ppm</i> | <i>20 ppm</i> | <i>30 ppm</i> | <i>40 ppm</i> | <i>50 ppm</i> |
|--------------------------------|------------------------|--------------|---------------|---------------|---------------|---------------|---------------|
| PANI | 96 | 32 | 29 | 25 | 25 | 13 | 9 |
| PANI-CA-1 | 72 | 28 | 26 | 23 | 20 | 10 | 5 |
| PANI-CA-3 | 73 | 28 | 27 | 23 | 20 | 9 | 2 |

Recovery time (min):

| Material Name | 1 ppm | 5 ppm | 10 ppm | 20 ppm | 30 ppm | 40 ppm | 50 ppm |
|--------------------------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|
| PANI | 5.25 | 18 | 30 | 31.5 | 34 | 35 | 38 |
| PANI-CA-1 | 16 | 21 | 25 | 28 | 30 | 32 | 35 |
| PANI-CA-3 | 18 | 23 | 27.5 | 29 | 33 | 34 | 36 |

Table S3. Repeatability data of PANI (a) PANI-CA-1 (b) PANI-CA-3 (c) sensor as normalized current (I/I_0) to the same concentration of H_2S (20 ppm) flowed through the measuring chamber (1000 sccm, $V = +0.1$ V)

| <i>Sensor</i> | <i>trial 1</i> | <i>trial 2</i> | <i>trial 3</i> | <i>Average</i> | <i>SD</i> |
|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <i>PANI</i> | 6.68551 | 6.70123 | 6.69212 | 6.692953 | 0.007893 |
| <i>PANI-CA-1</i> | 12.70123 | 12.80968 | 12.90968 | 12.80686 | 0.104254 |
| <i>PANI-CA-3</i> | 13.87278 | 13.8901 | 13.90102 | 13.88797 | 0.01424 |

