APPENDICES

APPENDIX A

INSTRUMENT

A.1 Flame Spray Pyrolysis Reactor

Figure A.1 Flame Spray Pyrolysis Reactor at the NRL Research Laboratory Chiang Mai University.

A.2 X-ray diffractometer (XRD)

Figure A.2 X-ray Diffractometer, Rigaku, Miniflex II, Japan.

A.3 Scanning Electron Microscope (SEM) and Energy Dispersive X-Ray Spectrometer (EDS)

Figure A.3 Scanning Electron Microscope & Energy Dispersive X-Ray Spectrometer, JSM-6335F, JEOL, Japan.

A.4 Transmission Electron Microscope (TEM)

Figure A.4 Transmission Electron Microscope, JEM-2010, JOEL, Japan.

A.5 Surface area analyzer (BET)

Figure A.5 Surface area analyzer, Quantachrome Autosorb 1 MP, USA.

APPENDIX B

JCPDS INFORMATION

B.1 JCPDS File No. 21−1272 of Titanium Dioxide (Anatase)

Anatase, syn (Titanium Oxide) TiO_2

Radiation=CuKa1 Lambda=1.5406 Filter=

Calibration= 2T=25.281–152.631 I/Ic(RIR)=3.3

Ref: Natl. Bur. Stand. (U.S.) Monogr. 25, v7

Tetragonal-Powder Diffraction, $I4_1/amd$ (141) Z=4

P.S=tI12.00

CELL: 3.7852 x 3.7852 x 9.5139 <90.0 x 90.0 x 90.0>

Density(c)=3.893 Density(m)= Mwt=79.9 Vol=136.31 F(30)=74.5(0.0115,35/0)

Ref:

2-Theta	Int	(h k l)	2-Theta	Int	(h k l)
25.281	100.0	(1 0 1)	62.120	4.0	(2 1 3)
36.947	10.0	(1 0 3)	62.690	14.0	(2 0 4)
37.801	20.0	(0 0 4)	68.762	6.0	(1 1 6)
38.576	10.0	(1 1 2)	70.310	6.0	(2 2 0)
48.050	35.0	(2 0 0)	74.031	2.0	(1 0 7)
53.891	20.0	(1 0 5)	75.031	10.0	(2 1 5)
55.061	20.0	(2 1 1)	76.019	4.0	(3 0 1)

B.2 JCPDS File No. 21−1276 of Titanium Dioxide (Rutile)

Rutile, syn (Titanium Oxide) TiO_2

Radiation=CuKa1 Lambda=1.5406 Filter=

Calibration= 2T=27.438–143.112 I/Ic(RIR)=3.6

Ref: Natl. Bur. Stand. (U.S.) Monogr. 25, v7 p83 (1969)

Tetragonal-Powder Diffraction, $P4_2/mmm$ (136) Z=2

CELL: 4.5933 x 2.9592 x 0.6442

2-Theta	Int	(h k l)	2-Theta	Int	(h k l)
27.446	100	1 1 0	65.478	2	2 2 1
36.085	50	1 0 1	69.008	20	3 0 1
39.187	8	2 0 0	69.788	12	1 1 2
41.225	25	1 1 1	72.408	2	3 1 1
44.050	10	2 1 0	74.409	1	3 2 0
54.322	60	2 1 1	76.508	4	2 0 2
56.640	20	2 2 0	79.819	2	2 1 2
62.740	10	0 0 2	82.333	6	3 2 1
64.038	10	3 1 0			

B.3 JCPDS File No. 87–0640 of Pt

Platinum, Pt

Radiation=CuKa1 Lambda=1.5406 Filter=

Calibration= 2T=39.893–86.044 I/Icor=24.54

Ref: Calculated from ICSD using POWD-12++, (1997)

Cubic-Powder Diffraction, Fm3m (225)

CELL: 3.911

2-Theta	Int	(h k l)	2-Theta	Int	(h k l)
39.893	999*	1 1 1	81.572	233	3 1 1
46.397	455	2 0 0	86.044	64	2 2 2
67.708	230	2 2 0			

B.4 JCPDS File No. 04−0784 of Au

Gold (Au)

Radiation=CuKa1 Lambda=1.54056 Filter=Ni

Calibration= 2T=38.184–135.41 I/Ic

Ref: Swanson, Tatge, Natl, Bur, Stand, (U.S.), Circ. 539, I, 33(1953)

Cubic-Powder Diffraction, Fm3m (225) Z=2

CELL: 4.078

2-Theta	Int	(h k l)	2-Theta	Int	(h k l)
38.184	100	1 1 1	98.133	6	4 0 0
44.392	52	2 0 0	110.79	23	3 3 1
64.576	32	2 2 0	115.25	22	4 2 0
77.547	36	3 1 1	135.41	23	4 2 2
81.721	12	2 2 2			

B.5 JCPDS File No. 87−0717 of Ag

Silver (Ag)

Radiation=CuKa1 Lambda=1.5406 Filter=

Calibration= 2T=38.199–81.552 I/Ic(RIR)=17.20

Ref: Calculated from ICSD using POWD−12++, (1997)

Cubic-Powder Diffraction, Fm3m (225) Z=4

CELL: 4.0857(2)

2-Theta	Int	(h k l)
38.119	999*	1 1 1
44.305	447	2 0 0
64.452	223	2 2 0
77.409	220	3 1 1
81.552	60	2 2 2

CURRICULUM VITAE

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Publications and Presentations

Journal Article

1. **Chomkitichai W.**, Tamaekong N., Liewhiran C., Wisitsoraat A., Sriwichai S., Phanichphant S., H_2 Sensor based on Au/TiO_2 nanoparticles synthesized by flame spray pyrolysis, *Eng. J.*, 2012, **16**, 135−142.

2. **Chomkitichai W.**, Ninsonti H., Liewhiran C., Wisitsoraat A., Sriwichai S., Phanichphant S., Flame-made Pt-loaded TiO_2 thin films and their application as H_2 gas sensors, *J. Nanomater.*, 2013, **2013**, 1−8., doi.org/10.1155/2013/497318.
3. Ninsonti H., **Chomkitichai W.**, Baba A., Kangwansupamonkon W., Phanichphant S., Shinbo K., Kato K., Kaneko F., Enhanced photocurrent properties of dye/Au-loaded TiO_2 films by grating-coupled surface plasmon excitation, *Ieice. T. Electron.*, 2013, **E69-C**, 258−388.

Conference papers/Presentations

1. **Chomkitichai W.**, Tamaekong N., Wisitsoraat A., Phanichphant S., Nitrogen dioxide sensor based on gold-doped titanium dioxide nanoparticle synthesized by flame spray pyrolysis, Oral Presentation, ACCS-9: Asian Conference on Chemical Sensors, 14−17 November 2011, Chientan, Youth Activity Center, Taipei, Taiwan.
2. **Chomkitichai W.**, Tamaekong N., Liewhiran C., Wisitsoraat A., Sriwichai S., Phanichphant S., H_2 sensor based on Au/TiO_2 nanoparticles synthesized by flame spray pyrolysis, Oral Presentation, GTSNN 2011: Green Nanotechnology for the Future, 13−14September 2011, Nakhon Ratchasima, Thailand.
3. **Chomkitichai W.**, Tamaekong N., Siriwong C., Phanichphant S., Characterization of Au/TiO_2 nanoparticles by flame spray pyrolysis,

Poster Presentation, PACCON 2012, 11−13 January 2012, The Empress Hotel, Chiang Mai, Thailand.

4. **Chomkitichai W.**, Ninsonti H., Tamaekong N., Liewhiran C., Wisitsoraat A., Sriwichai S., Phanichphant S., Thailand. Flame-made Pt-loaded TiO_2 thin films and their application as H_2 gas sonsors, Poster Presentation, The 8th Asian Meeting on Ferroelectrics (AMF-8), 9−14 December 2012, Amari Orchid Hotel, Pattaya, Thailand.
5. **Chomkitichai W.**, Ninsonti H., Liewhiran C., Wisitsoraat A., Sriwichai S., Phanichphant S., Enhancement of sensor response towards ethanol and acetone sensing based on metal (Au, Pt)-loaded titanium dioxide nanoparticles, Poster Presentation, ACCS-2013: Asian Conference on Chemical Sensors, 11−14 November 2013, The Empress Hotel, Chiang Mai, Thailand.