

## REFERENCES

- Ahlskog, M., Reghu,M., Noguchi, T.. and Ohnishi, T. (1997) Doping and conductivity studies poly(p-phenylene vinylene). Synthetic Metals. 89, 11-15.
- Aguilar, A.D., Forzani, E.S., Leright, M., Tsow, F., Cagan, A., Iglesias, R.A., Nagahara, L.A., Amlani, I., Tsiu, R., and Tao, N.J. (2010) A hybrid nanosensor for TNT vapor detection. Nano Letters, 10, 380-384.
- Alkskas, I.A. and Moosa, I.S. (2012) Synthesis, characterization, and electrical properties of new crosslinked conjugated polymer based on acetyl acetone moiety. International Journal of Polymeric Materials and Polymeric Biomaterials, 61, 1142-1153.
- Arvand, M., Ansari, R., and Heydari, L. (2011) Development of a conductive composite based on polythiophene/Y-zeolite and its response towards sulfide ions. Materials Science and Engineering: C, 31, 1398-1404.
- Ates, M., Karazehir, T., and Sarac, A.S. (2012) Conducting polymers and their applications. Current Physical Chemistry, 2, 224-240.
- Ayad, M.M., Hefnawey, G.E., and Torad, N.L. (2009) A sensor of alcohol vapours based on thin polyaniline base film and quartz crystal microbalance. Journal of Hazardous Materials, 168, 85-88.
- Auerbach, S.M., Carrado, K.A., and Dutta, P.K. (Eds.) (2003) Handbook of Zeolite Science and Technology. New York: Marcel Dekker.
- Babaei, M. and Alizadeh, N. (2013) Methanol selective gas sensor based on nano-structured conducting polypyrrole prepared by electrochemically on interdigital electrodes for biodiesel analysis. Sensors and Actuators B: Chemical, 183, 617-626.
- Babudri, F., Farinola, G.M., Giancane, S., Naso, F., Rella, R., Scarpa, A., and Valli, L. (2002) Deposition and application in gas sensors of thin films of a bridged chain dialkoxy derivative. Materials Science and Engineering: C, 22, 445-448.
- Bai, H., Li, C., Chen, F., and Shi, G. (2007) Aligned three-dimensional micro structures of conducting polymer composites. Polymer, 48, 5259-5267.

- Bai, H. and Shi, G. (2007) Gas sensors based on conducting polymers. *Sensors*, 7, 267-307.
- Bartlett, P.N. and Gardner, J.W. (1996) Diffusion and binding of molecules to sites within homogeneous thin films. *Philosophical Transactions of the Royal Society A: Mathematical Physical & Engineering Sciences*, 354 (1704), 35 - 57.
- Benvenho, A.R.V., Li, R.W.C., and Gruber, J. (2009) Polymeric electronic gas sensor for determining alcohol content in automotive fuels. *Sensors and Actuators B: Chemical*, 136, 173-176.
- Biaglow, A.I., Gorte, R.J., and David W. (1993) Molecular motions and  $^{13}\text{C}$  chemical shift anisotropy of acetone adsorbed in H-ZSM-5 zeolite. *Journal of Physical Chemistry B*, 97, 7135-713.
- Boampong, S.A. and Belbruno, J.J. (2013) Detection of formaldehyde vapor using conductive polymer films. *Sensors and Actuators B: Chemical*, 182, 300-306.
- Boekfa, B., Pantu, P., Probst, M., and Limtrakul, J. (2010) Adsorption and tautomerization reaction of acetone on acidic zeolites: the confinement effect in different types of zeolites. *Journal of Physical Chemistry C*, 114, 15061-15067.
- Breck, D.W. (1974) *Zeolite Molecular Sieves: Structure, Chemistry, and Use*. New York: John Wiley and Sons.
- Chang, C.J., Lin, C.K., Chen, C.C., Chen, Y.C., and Kuo, E.H. (2011) Gas sensor with porous three dimensional framework using  $\text{TiO}_2$ /polymer double shell hollow microsphere. *Thin Solid Films*, 520, 1546-1553.
- Chang, J.C., Hung, S.T., Lin, C.K., Chen, C.Y., and Kuo, E.H. (2010) Selective growth of  $\text{ZnO}$  nanorods for gas sensors using ink-jet printing and hydrothermal processes. *Thin Solid Films*, 519, 1693-1698.
- Chanthaanont, P. and Sirivat, A. (2012) Interaction of carbon monoxide with PEDOT-PSS/zeolite composite: effect of Si/Al ratio of ZSM-5 zeolite. *e-Polymer*, 12(1), 106-116.

- Chanthaanont, P. and Sirivat, A. (2013) Effect of transition metal ion-exchanged into the zeolite Y on electrical conductivity and response of PEDOT-PSS/MY composites toward SO<sub>2</sub>. *Advances in Polymer Technology*, 32(4), 1-6.
- Chiang, C.J., Tsai, K.T., Lee, Y.H., Lin, H.W., Yang, Y.L., Shih, C.C., Lin C.Y., Jeng, H.A., Weng, Y.H., Cheng, Y.Y., Ho, K.C., and Dai, C.A. (2013) In situ fabrication of conducting polymer composite film as a chemical resistive CO<sub>2</sub> gas sensor. *Microelectronic Engineering*, 111, 409-415.
- Chuapradit, C., Wannathong, L., Chotpattananont, D., Hiamtup, P., Sirivat, A.. and Schwank, J. (2005) Polyaniline/zeolite LTA composites and electrical conductivity response towards CO. *Polymer*, 46, 947-953.
- Cirpan, A., Kucukyavuz, Z., and Kucukyavuz, S. (2003) Synthesis, characterization, and electrical conductivity of poly (paraphenylen vinylene). *Turkish Journal of Chemistry*, 27, 135-144.
- Collins, G.E. and Buckley, L.J. (1996) Conductive polymer-coated fabrics for chemical sensing. *Synthetic Metals*, 78, 93-101.
- Dan, Y., Cao, Y., Mallouk, T.E., Evoy, S., and Johnson A.T.C. (2009) Gas sensing properties of single conducting polymer nanowires and the effect of temperature. *Nanotechnology*, 29, 434014-434018.
- Das, T.K., and Prusty, S. (2012) Review on conducting polymers and their applications. *Polymer-Plastics Technology and Engineering*, 51, 1487-1500.
- Dekker, M., Zand, I.T., Schram, J., and Schoonman, J. (1989) NH<sub>4</sub> and HY zeolites as electrolytes in hydrogen sensors. *Solid State Ionics*, 35, 157-164.
- Densakulprasert, N., Wannatong, L., Chotpattananont, D., Hiamtup, P.. Sirivat, A., and Schwank, J. (2005) Electrical conductivity of polyaniline/zeolite composites and synergistic interaction with CO. *Materials Science and Engineering: B*, 117, 276-282.
- Dixit, V., Misra, S.C.K., Sharma, B.S. (2005) Carbon monoxide sensitivity of vacuum deposited polyaniline semiconducting thin films. *Sensors and Actuators B: Chemical*, 104, 90-93.
- Do, J.S. and Wang, S.H. (2013) On the sensitivity of conductometric acetone gas sensor based on polypyrrole and polyaniline conducting polymers. *Sensors and Actuators B: Chemical*, 185, 39-46.

- Dubbe, A. (2009) The effect of platinum clusters in the zeolite micropores of a zeolite-based potentiometric hydrocarbon gas sensor. Sensors and Actuators B: Chemical, 137, 205-208.
- Dubbe, A. (2008) Influence of the sensitive zeolite material on the characteristics of a potentiometric hydrocarbon gas sensor. Solid State Ionics, 149, 1645-1647.
- Fameth, W.E. and Gorte, R.J. (1995) Methods for characterizing zeolite acidity. Chemical Reviews, 95, 615-635.
- Fanget, S., Hentz, S., Puget, P., Arcamone, J., Matheron, M., Colinet, E., Andreucci, P., Duraffourg, L., Myers, E., and Roukes, M.L. (2011) Gas sensor based on gravimetric detection: A review. Sensors and Actuators B: Chemical, 160, 804-821.
- Florian, J. and Kubelkova, L. (1994) Proton transfer between H-Zeolite and adsorbed acetone or acetonitrile: quantum chemical and FTIR study. Journal of Physical Chemistry C, 98, 8734-8741.
- Gaare, K. and Akporiaye, D. (1997) Effects of La exchange on NaY and NaX zeolites as characterized by  $^{29}\text{Si}$  NMR. Journal of Physical Chemistry B, 101, 48-54.
- Gagnon, D., Capiston, J., Karasz, F.E., and Lenz, R.W., (1987) Synthesis, doping, and electrical conductivity of high molecular weight poly(p-phenylene vinylene). Polymer, 28, 567-573.
- Gao, J.F., Yan, D.X., Huang, H.D., Zeng, X.B., Zhang, W.Q., and Li, Z.M. (2011) Tunable positive liquid coefficient of an anisotropically conductive carbon nanotube-polymer composite. Journal of Polymer Research, 18, 2239-2243.
- Hagen, G., Dubbe, A., Rettig, F., Jerger, A., Birkhofer, Th., Muller, R., Polg, C., and Moos, R. (2006) Selective impedance based gas sensors for hydrocarbons using ZSM-5 zeolite films with chromium(III)oxide interface. Sensors and Actuators B: Chemical, 119, 441-448.
- Hangarter, C.M., Chartuprayoon, N., Hernandez, S.C., Choa, Y., and Myung, N.V. (2013) Hybridized conducting polymer chemiresistive nano-sensors. Nano Today, 291, 1-17.

- Heeger, A.J. and Diaz-Gracia, M.A. (1998) Semiconducting polymers as a material for photonic device. *Current Opinion in Solid State Materials Science*, 3, 16-22.
- Hoost, T.E., Lafraimboise, K.A., and Otto, K. (1996) Infrared study of acetone and nitrogen oxides on Cu-ZSM-5. *Catalysis Letters*, 37, 153-156.
- Hosseini S.H., and Entezami A.A. (2003) Conducting polymer blends of polypyrrole with polystyrene, poly(vinyl chloride) and poly(vinyl acetate) based toxic gas sensors. *Journal of Applied Polymer Science*, 90, 49.
- Hu, H., Trejo, M., Nicho, M.E., Saniger, J.M., and Valenzuela, A.G. (2002) Adsorption kinetics of optochemical NH<sub>3</sub> gas sensing with semiconductor polyaniline films. *Sensors and Actuators B: Chemical*, 82, 14-23.
- Huang, H., Zhou, J., Chen, S., Zeng, L., and Huang, Y. (2004) A highly sensitive QCM sensor coated with Ag<sup>+</sup>-ZSM-5 film for medical diagnosis. *Sensors and Actuators B: Chemical*, 82, 14-23.
- Hung, S.T., Chang, C.J., Hsu, C.H., Chu, B.H., Lo, C.F., Hsu, C.C., Pearton, S.J., and Holzworth, M.R. (2012) SnO<sub>2</sub> functionalized AlGaN/GaN high electron mobility transistor for hydrogen sensing application. *International Journal of Hydrogen Energy*, 37, 13783-13788.
- Jalkane, T., Tuura, J., Makila, E., and Salonen, J. (2010) Electro-optical porous silicon gas sensor with enhance selectivity. *Sensors and Actuators B: Chemical*, 147, 100-104.
- Ji, X., Yao, W., Peng, J., Ren, N., Zhou, J., and Huang, Y. (2012) Evaluation of Cu-ZSM-5 zeolites as QCM sensor coatings for DMMP detection. *Sensors and Actuators B: Chemical*, 166-167, 50-55.
- Jia, Q., Zhang, Y., Chen, Y., Sun, X., and Jin, Z. (2014) Rapid and selective detection of acetone using hierarchical ZnO gas sensor for hazardous odor markers application. *Journal of Hazardous Materials*, 276, 262-270.
- Jung, Y.S., Jung, W., Tuller, H.L., and Ross, C.A. (2008) Nanowire conductive polymer gas sensor patterned using self-assembled block copolymer lithography. *Nano Letters*, 8, 3776-3780.

- Kamonsawas, J., Sirivat, A., Niamlang, S., Hormnirun, P., and Prissanaroon-Oujai, W. (2010) Electrical conductivity response of poly(phenylene vinylene)/zeolite composites exposed to ammonium nitrate. *Sensors*. 10, 5590-5603.
- Kamonsawas, J., Sirivat, A., and Hormnirun, P. (2012) Poly(phenylene vinylene)/zeolite Y composite as a ketone vapors sensor: effect of alkaline cations. *Journal of Polymer Research*, 19, 1-12.
- Kamonsawas, J., Sirivat, A., and Hormnirun, P. (2013) Sensitive and selective responses of poly(phenylene vinylene)/zeolite Y-based sensors towards ketone vapors. *International Journal of Polymeric Materials and Polymeric Biomaterials*, 62:11, 583-589.
- Kaneko, H., and Ishiguro, T. (1994) Electrical conductance in metallic phases of fully doped polyacetylene. *Synthetic Metals*, 65, 141.
- Kumar, D. and Sharma, R.C. (1998) Advanced in conductive polymer. *European Polymer Journal*, 1053-1060.
- Kwon, O.S., Hong, J.Y., Park, S.J., Jang, Y., and Jang, J. (2010) Resistive gas sensors based on precisely size-controlled polypyrrole nanoparticles: effects of particle size and deposition method. *Journal of Physical Chemistry C*. 114, 18874-18879.
- Lange, U., Nataliya, V., Roznyatovskaya, V., and Mirsky, M. (2008) Conducting polymer in chemical sensors and arrays. *Analytical Chemical Acta*. 614. 1-26.
- Lenz, R.W., Han, C.C., Smith, J.H., and Karasz, F.E. (1988) Preparation of poly(phenylene vinylene) from cycloalkylene sulfonium salt monomer and polymer. *Journal of Polymer Science Part A: Polymer Chemistry*. 26. 3241-3249.
- Li, J., Fan, H., and Jia, X. (2010) Multilayered ZnO nanosheets with 3D porous architectures: synthesis and gas sensing application. *Journal of Physical Chemistry C*, 114, 14684-14691.
- Li, R.C.W., Ventura, L., Gruber, J., Kawano, Y., and Carvalho, L.R.F. (2008) A selective conductive polymer-based sensor for volatile halogenated organic compound (VHOC). *Sensors and Actuators B: Chemical*. 131, 646-651.

- Li, X. and Dutta, P.K. (2010) Interaction of dimethylmethylphosphate with zeolite Y: impedance-based sensor for detecting nerve agent simulants. Journal of Physical Chemistry C, 114, 7986-7994.
- Li, X. and Xue, D. (2006) Estimation of electronegativity values of elements in different valence states. Journal of Physical Chemistry A, 110, 11332-11337.
- Lin, C.Y., Chen, J.C., Hu, C.W., Tunney, J.J., and Ho, K.C. (2009) Using PEDOT: PSS modified electrode for detecting nitric oxide gas. Sensors and Actuators B: Chemical, 140, 402-406.
- Liu, X., Cheng, S., Liu, H., Hu, S., Zhang, D., and Ning, H. (2012) A survey on gas sensing technology. Sensors, 12, 9635-9665.
- Luo, Y.L., Miao, Y., Xu, F., and Yao, Y. (2012) Novel HTPB/MWNT-COOH PU conductive polymer composite films for detection of hazardous organic solvent vapors. Polymer-Plastics Technology and Engineering, 51, 290-297.
- Luo, Y., Yu, W., and Xu F. Surface modification and vapor-induced response of poly(vinylidene fluoride)/carbon black composite conductive thin films (2011) Polymer-Plastics Technology and Engineering, 50, 1084-1090.
- Martins, A.V.G., Berlier ,G., Bisio, C., Coluccia, S., Pastore, H.O., and Marchese, L. (2008) Quantification of bronzed sites in microporous catalysts by a combined FTIR and NH<sub>3</sub>-TPD study. Journal of Physical Chemistry C, 112, 7139-7120.
- Mashat, L.A., Chouvy, C.D., Borensztajn, S., and Wlodarski, W. (2012) Electropolymerized polypyrrole nanowires for hydrogen gas sensing. Journal of Physical Chemistry C, 116, 13388-13394.
- Matsuguchi, M., Uno, T., Aoki, T., and Yoshida, M. (2008) Chemically modified copolymer coatings for mass-sensitive toluene vapor sensors. Sensors and Actuators B: Chemical, 131, 652-659.
- McKeen, J.C. and Davis, M.E. (2009) Conductivity of mono and divalent cation in the microporous zirconosilicate VPI9. Journal of Physical Chemistry C, 113, 9870-9877.

- Misra, S.C.K., Mathur, P., and Srivastana, B.K. (2004) Vacuum deposited nanocrystalline polyaniline thin film sensors for detection of carbon monoxide. Sensors and Actuators A: Physical, 114, 30-35.
- Mishira, I., Akinyeye, R., Baker, P., and Iwuoha, E. (2011) Synthesis and characterization of sulfonated polyanilines and application in construction of a diazinon biosensor. International Journal of Polymeric Materials and Polymeric Biomaterials, 60, 469-489.
- Montserrat, V., Joaquin, C., Albert, C., Albert, C., Ramon, M.J., and Jesus, S. (2007) Gas detection with SnO<sub>2</sub> sensors modified by zeolite films. Sensors and Actuators B: Chemical, 124, 99-110.
- Mori, M., Nishimura, H., Itagaki, Y., and Sadaoka, Y. (2009) Potentiometric VOC detection in air using 8YSZ-based oxygen sensor modified with SmFeO<sub>3</sub> catalytic layer. Sensors and Actuators B: Chemical, 142, 141-146.
- Ohira, S.I., Goto, K., Toda, K., and Dasgupta, P.K. (2012) A capacitance sensor for water: trace moisture measurement in gases and organic solvents. Analytical Chemistry, 84, 8891-8897.
- Ogura, K. and Shiigi, H. (1999) A CO<sub>2</sub> sensing composite film consisting of base-type poly(aniline) and poly(vinyl alcohol). Electrochemical and Solid-State Letters, 2, 478-480.
- Panov, A.G. and Fripiat, J.J. (1998) An infrared study of acetone and mesityl oxide adsorption on acid catalyst. Langmuir, 14, 3788-3796.
- Pandey S.K., Kim K.H., and Tang K.T. (2012) A review of sensor based methods for monitoring hydrogen sulfide. Trends in Analytical Chemistry, 32, 87-99.
- Pejcic, B., Eadington, P., and Ross, A. (2007) Environmental monitoring of hydrocarbons: a chemical sensor perspective. Environmental Science and Technology, 41(18), 6333-6342.
- Peres, O.P., Fernandes, M.R., Garcia, J.R., Wang, S.H., and Nart, F.C. (2006) Synthesis and characterization of chloro and bromo substituted p-phenylene vinylene homopolymers and alternating copolymers. Synthetic Metals, 156, 529-536.

- Peres, O.P. and Gruber, J. (2007) The use of block copolymers containing PPV in gas sensors for electronic noses. Materials Science Engineering: C, 27, 67-69.
- Peres, O.P., Li, R.W.C., Yamauchi, E.Y., Lippi, R., and Gruber, J. (2012) Conductive polymer gas sensor for quantitative detection of methanol in Brazilian sugar-cane spirit. Sensors and Actuators B: Chemical, 130, 1105-1107.
- Permpool, T., Supaphol, P., Sirivat, A., and Wannatong, L. (2012) Polydiphenylamine-polyethylene oxide blends as methanol sensing materials. Advances in Polymer Technology, 31(4), 401-413.
- Permpool, T., Sirivat, A., Aussawasathien, D., and Wannatong, L. (2013) Development of polydiphenylamine/zeolite Y composite by dealumination process as a sensing material for halogenated solvents. Polymer-Plastics Technology and Engineering, 52, 907-920.
- Permpool, T., Sirivat, A., and Aussawasathien, D. (2014) Synthesis of polydiphenylamine with tunable size and shape via emulsion polymerization. Polymer International (accepted).
- Phumman, P., Niamlang, S., and Sirivat, A. (2009) Fabrication of poly(p-phenylene)/zeolite composites and their responses towards ammonia. Sensors, 9(10), 8031-8046
- Pirsa, S. and Alizadeh, N. (2012) A selective DMSO gas sensor based on nanostructured conducting polypyrrole doped with sulfonate anion. Sensors and Actuators B: Chemical, 168, 303-309.
- Radhakrishnan, S., Paul, S. (2007) Conducting polypyrrole modified with ferrocene for applications in carbon monoxide sensors. Sensors and Actuators B: Chemical, 125, 60-65.
- Ram, M.K., Yavuz, O., Lahsangah, V., and Aldissi, M. (2005) CO gas sensing from ultrathin nano-composite conducting polymer film. Sensors and Actuators B: Chemical, 106, 750-757.
- Ruangchuay, L., Sirivat, A., and Schwank, J. (2003) Polypyrrole/poly(methyl methacrylate) blend as selective sensor for acetone in lacquer. Talanta, 60, 25-30.

- Ruangchuay, L., Sirivat, A., and Schwank, J. (2004) Electrical conductivity response of polypyrrole to acetone vapor: effect of dopant anions and interaction mechanisms. Synthetic Metals, 140, 15-21.
- Ruangchuay, L., Sirivat, A., and Schwank, J. (2004) Selective conductivity response of polypyrrole-based sensor on flammable chemicals. Reactive and Functional Polymers, 61, 11-22.
- Sahner, K., Hagen, G., Schonauer, D., Reib, S., and Moo, R. (2008) Zeolites—versatile materials for gas sensors. Solid State Ionics, 179, 2416-2423.
- Satsuma, A., Yang, D., and Shimizu, K.I. (2011) Effect of pore diameter of zeolites on detection of base molecules by zeolite thick film sensor. Microporous and Mesoporous Materials, 141, 20-25.
- Sazama, P., Jirglova, H., and Dedecek, J. (2008) Ag-ZSM-5 zeolite as high-temperature water-vapor sensor material. Materials Letters, 62, 4239-4241.
- Shannon. R.D. (1976) Revised effective ionic radii and systematic studies of interatomic distances in halides and chalcogenides. Acta Crystallographica Section A, 32, 751-767.
- Sharma, A.L., Kumar, P., and Deep, P. (2012) Highly sensitive glucose sensing with multi-walled carbon nanotubes – polyaniline composite. Polymer-Plastics Technology and Engineering, 51, 1382-1387.
- Shinde, N.M., Deshmukh, P.R., Patil, S.V., and Lokhande, C.D. (2013) Development of polyaniline/Cu<sub>2</sub>ZnSnS<sub>4</sub> (CZTS) thin film based heterostructure as room temperature LPG sensor. Sensors and Actuators A: Physical, 193, 79-86.
- Shirakawa, H. and Ikeda, S. (1971) Infared spectra of polyacetylene. Polymer Journal, 2, 231-244.
- Shukla, P., Bhatia, V., Gaur, V., and Jain, V.K. (2011) electrostatically functionalized multiwalled carbon nanotube/PMMA composite thin films for organic vapor detection. Polymer-Plastics Technology and Engineering, 50, 1179-1184.
- Si, P., Mortensen, J., Komolov, A., Denborg, J.,and Moller, P.J. (2007) Polymer coated quartz crystal microbalance sensors for detection of volatile organic compounds in gas mixtures. Analytica Chemica Acta, 596, 223-230.
- Soontornworajit, B., Wannatong, L., Hiamtup, P., Niamlang, S., Chotpattananont, D., Sirivat, A., and Schwank, J. (2007) Induced interaction between

- polypyrrole and SO<sub>2</sub> via molecular sieve 13X. Materials Science and Engineering: B, 15, 78-86.
- Tang, L., Li, Y., Xu, K., Hou, X., and Lv, Y. (2008) Sensitive and selective acetone sensor based on its cataluminescence from Nano-La<sub>2</sub>O<sub>3</sub> Surface. Sensors and Actuators B: Chemical, 132, 243-249.
- Tai, H., Yang, Y., Xie, G., Yu, J., Chen, X., and Ying, Z. (2008) Influence of polymerization temperature on NH<sub>3</sub> response of PANI/TiO<sub>2</sub> thin film gas. Sensors and Actuators B. 129, 319-326.
- Thongchai, N., Kunanuruksapong, R., Niamlang, S., Wannatong, L., Sirivat, A., and Wongkasemjit, S. (2009) Interactions between CO and poly(p-phenylene vinylene) as induced by ion-exchanged zeolites. Materials. 2, 2259-2275.
- Thuwachaosoan, K., Chottananont, D., Sirivat, A., Rujiravanit, R., and Schwank, J. (2007) Electrical conductivity responses and interactions of poly(3-thiopheneacetic acid)/zeolites L, mordenite, beta and H<sub>2</sub>. Materials Science and Engineering: B. 140, 23-30.
- Tuan, C.V., Tuan, M.A., Hieu, N.V., and Trang, T. (2012) Electrochemical synthesis of polyaniline nanowires on Pt interdigitated microelectrode for room temperature NH<sub>3</sub> gas sensor application. Current Applied Physics. 12, 1011-1016.
- Urbiztondo, M.A., Pellejero, I., Villarroya, M., Sese, J., Pina, M.P., Dufour, I., and Santamaria, J. (2009) Zeolite-modified cantilevers for the sensing of nitrotoluene vapors. Sensors and Actuators B: Chemical. 137, 608-616.
- Urbiztondo, M.A., Peralta, A., Pellejero, I., Sese, J., Pina M.P., Dufour, I., and Santamaria, J. (2012) Detection of organic vapours with Si cantilevers coated with inorganic (zeolite) or organic (polymer) layers. Sensors and Actuators B: Chemical, 171-172, 822-831.
- Varsani, P., Afonja, A., Williams, D.E., Parkin, I.P., and Binions, R. (2011) Zeolite-modified WO<sub>3</sub> gas sensors-enhanced detection of NO<sub>2</sub>. Sensors and Actuators B: Chemical, 160, 475-482.

- Vaddiraju, S.. and Gleason, K.K. (2010) Selective sensing of volatile organic compounds using novel conducting polymer–metal nanoparticle hybrids. *Nanotechnology*, 21, 125503-125512.
- Vijaya, J.J., Kenedy, L.J., Sekaran, G., Bayhan, M., and William, M. (2008) Preparation and VOC gas sensing properties of Sr(II)-added copper aluminate spinel composites. *Sensors and Actuators B: Chemical*, 134, 604-612.
- Vilaseca. M., Coronas, J., Cirera. A., Cornet, A., Morante, J.R., and Santamaria, J. (2011) Use of zeolite films to improve the selectivity of reactive gas sensors. *Catalysis Today*, 82, 179-185.
- Vijayakumar, N., Subramanian, E., and Padiyan, D.P. (2012) Conducting polyaniline blends with the soft template poly(vinyl pyrrolidone) and their chemosensor application. *International Journal of Polymeric Materials and Polymeric Biomaterials*, 61, 847-863.
- Volf, R., Kral, J., Shishkanova, T.V., Broncova, G., Krondak, M., Grotschelova, S., Stastny, M., Kroulik, J., Valik, M., Matejka, P., and Volka K. (2002) Preparation, characterization, and analytical application of electropolymerized films. *Solid State Ionics*, 154-155, 57-63.
- Wan, X., Song, H., Zhao, D.. Zhang, L., and Lv, Y (2014) A Y-doped metal-organic framework-based cataluminescence gas sensor for isobutanol. *Sensors and Actuators B: Chemical*, 201, 413-419.
- Wannatong, L., and Sirivat, A. (2008) Polypyrrole and its composites with 3A zeolite and polyamide 6 as sensors for four chemicals in lacquer thinner. *Reactive and Functional Polymers*, 68, 1646-1651.
- Wasastjerna, J. (1923) On the radii of ions. *Societas Scientiarum Fennica*, 1(38), 1-25.
- Wessling, R.A., and Zimmerman, R.G. (1968) Polyelectrolytes from bis-sulfonium salts. *U.S. Patent*, 3, 401, 152.
- Xie, D., Jiang, Y., Pan, W., Li, D., Wu, Z., and Li, Y., (2002) Fabrication and characterization of polyaniline based gas sensor by ultra-thin film technology. *Sensors and Actuators B: Chemical*, 81, 158-164.

- Xu, X., Wang, J., and Long, Y. Zeolite-based materials for gas sensors. Sensors, 6, 1751-1764.
- Yang, P., Ye, X., Lau, C., Li, Z., Liu, X., and Lu, J. (2007) Design of efficient zeolite sensor materials for n-hexane. Analytical Chemistry, 79, 1425-1432.
- Yamazoe, N. (2005) Toward innovations of gas sensor technology. Sensors and Actuators B: Chemical, 108, 2-14.
- Yasada, K.E., Visser, J.H., and Bein, T. (2009) Molecular sieve catalysts on microcalorimeter chips for selective chemical sensor. Microporous and Mesoporous Materials, 119, 356-359.
- Yimlaimai, I., Niamlang, S., Chanthaanont, P., Kunanuruksapong, R., Changkhamchom, S., and Sirivat, A. (2011) Electrical conductivity response and sensitivity of ZSM-5, Y and mordenite zeolite towards ethanol vapor. Ionics 17, 607-615.
- Zhu, J.H, Ying, W., Yuan, C., and Wang, X.S. (1998) Dispersion of potassium nitrate and the resulting basicity on alumina and zeolite Y. Journal of the Chemical Society, Faraday Transactions, 94, 1163-1169.

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(M. S. Polymer Science), The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok. Thailand

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- 2004 Position: Student trainee  
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**Publications:**

1. Kamonsawas, J., Sirivat, A., Niamlang, S., Hormnirun, P., and Prissanaroon-Oujai, W. (2010) Electrical Conductivity Response of Poly(phenylene vinylene)/Zeolite Composites Exposed to Ammonium Nitrate. *Sensors*, 10, 5590-5603. (M.S. Thesis)
2. Kamonsawas, J., Sirivat, A.. and Hormnirun, P. (2012) Poly(phenylene vinylene)/Zeolite Y Composite as a Ketone Vapors Sensor: Effect of Alkaline Cations. *Journal of Polymer Research*, 19, 1-12.
3. Kamonsawas, J., Sirivat, A., and Hormnirun, P. (2013) Sensitive and Selective Responses of Poly(phenylene vinylene)/Zeolite Y-Based Sensors Towards Ketone Vapors. *International Journal of Polymeric Materials and Polymeric Biomaterials*, 62(11), 583-589.

4. Kamonsawas, J. and Sirivat, A. (2014) Effect of Transition Metals on the Electrical Conductivity Response of dPPV/Zeolite Y Composites towards Ketone Vapors. Advances in Polymer Technology. (Accepted)
5. Kamonsawas J. and Sirivat A. Improving Selective Properties of dPPV/(Zeolite Y, mordenite, 5A) and Response towards Chemical Vapors. Talanta. (Summited)

#### **Collaborated Work:**

1. Tangboriboon, N., Samattai, S., Kamonsawas, J., and Sirivat, A. Processing of Kaolinite and Alumina Loaded in Natural Rubber Composite Foams. Materials and Manufacturing Process. (Accepted )

#### **Proceeding:**

1. Kamonsawas, J., Sirivat, A., Hormnirun, P., and Prissanaroon-Oujai, W. (2008) Conductivity Response of Poly(Phenylene Vinylene)/Zeolite Composites Exposed to Ammonium Nitrate. Poster presented at The 14<sup>th</sup> Symposium on Petroleum, Petrochemicals and Polymers, Bangkok, Thailand. (M.S. Thesis)

#### **Presentations:**

1. Induced Interaction of NH<sub>4</sub>NO<sub>3</sub> with Poly(*p*- Phenylene Vinylene) by Mean of Zeolite Y., 6-10 March 2010, Paper presented at The Smart Structures and Materials + Nondestructive Evaluation and Health Monitoring (SPIE), San Diego, CA, USA. (Poster Presentation)
2. Poly(Para-Phenylene Vinylene)/Zeolite Y Composites and Electrical Conductivity Response towards Ketone Vapors., 10-14 June 2012, Paper presented at The 4<sup>th</sup> International Conference “Smart Materials, Structures and Systems”, Montecatini Terme, Tuscany, Italy. (Poster Presentation)
3. Sensitive and Selective Ketone Sensors Based on Poly(*p*-Phenylene Vinylene)/Zeolite Y Composites: Influence of Alkaline cation., 22 April 2013, Paper presented at The 1<sup>st</sup> Conductive and Electroactive Polymers Conference, Bangkok, Thailand. (Oral Presentation)

4. Improvement of Sensitive and Selective Properties of dPPV/Zeolite Y Composite towards Three Different Types of Ketone Vapor., 24-28 Jan 2014, Paper presented at The 14<sup>th</sup> International Symposium on Biomimetic Materials Process (BMMP 2014), Takayama, Japan. (Poster Presentation)
5. Electrical Conductivity Responses of dPPV/Zeolite Y Composites towards Ketone Vapors: Effect of Alkaline Cations., 23 May 2014, Paper presented at The 5<sup>th</sup> Research Symposium on Petrochemical and Materials Technology and The 20<sup>th</sup> PPC Symposium on Petroleum, Petrochemicals and Polymers, Bangkok, Thailand. (Oral Presentation)
6. Electrical Conductivity Responses of Poly(p-Phenylene Vinylene)/Zeolite Y Composites towards Ketone Vapors., 28-30 May 2014, Paper presented at The PhD-RGJ Congress 15, Pattaya, Chonburi, Thailand. (Poster Presentation)
7. The Selective Ketone Vapor Sensor Based on Poly(p-Phenylene Vinylene)/Zeolite Y Composites., 8-11 June 2014, Paper presented at The 4<sup>th</sup> International Conference on Materials and Application for Sensors and Transducers (IC-Mast 2014), Bilbao, Spain. (Poster Presentation)

#### **Master Presentations:**

1. Electrical Conductivity of Poly(p-Phenylene Vinylene)/Zeolite Composites and Synergetic Interaction with NH<sub>4</sub>NO<sub>3</sub>., 8-13 June 2008, Paper presented at The 3rd International Conference “Smart Materials, Structures and Systems” (CIMTEC 2008), Acireale (Catania District), Sicily, Italy. (Poster Presentation)
2. Induce Interaction of NH<sub>4</sub>NO<sub>3</sub> with Poly(p-Phenylene Vinylene) by Means of Zeolite Y., 10-14 March 2008, Paper presented at The APS March Meeting 2008, New Orleans, Louisiana, USA. (Poster Presentation)
3. Poly(p-Phenylene Vinylene)/Zeolite Y Composites Response towards NH<sub>4</sub>NO<sub>3</sub>., 22-25 April 2008, Paper presented at Smartmat'08&IWOFM-2, Chiangmai, Thailand. (Poster Presentation)

4. Conductivity Response of Poly(Phenylene Vinylene)/Zeolite Composites Exposed to Ammonium Nitrate., 23 April 2008, Poster presented at The 14 th Symposium on Petroleum, Petrochemicals and Polymers, Bangkok, Thailand.  
(Poster Presentation)