



June 2015

SMS instruments are used over a wide range of disciplines. To keep abreast with current research using dynamic vapor sorption and inverse gas chromatography, SMS regularly reviews the literature. The below papers represent recent peer-reviewed articles utilizing gravimetric vapor sorption or inverse gas chromatography.

DVS Articles:

T Saiga, S Sato, and K Nagai, "Water vapor solubility of poly(lactic acid) films modified the surface by vacuum ultraviolet irradiation" *Journal of Applied Polymer Science*, 132(27): (2015).

C Tsvigu, E Pavesi, MG De Angelis, and MG Baschetti, "Effect of relative humidity and temperature on the gas transport properties of 6FDA-6FpDA polyimide: Experimental study and modelling" *Journal of Membrane Science*, 485: 60-68 (2015).

P Udomkun, D Argyropoulos, M Nagle, B Mahayothee, and J Muller, "Sorption behaviour of papayas as affected by compositional and structural alterations from osmotic pretreatment and drying" *Journal of Food Engineering*, 157: 14-23 (2015).

X Li, D Banham, FX Feng, F Forouzandeh, SY Ye, DW Kwok, and V Birss, "Wettability of colloid-imprinted carbons by contact angle kinetics and water vapor sorption measurements" *Cement & Concrete Composites*, 87: 44-60 (2015).

ME Sormoli and TAG Langrish, "Moisture sorption isotherms and net isotheric heat of sorption for spray-dried pure orange juice powder" *Food Science and Technology*, 61(1): 875-885 (2015).

XQ Shi and QX Zhong, "Crystallinity and quality of spray-dried lactose powder improved by soluble soybean polysaccharide" *Food Science and Technology*, 62(1): 89-96 (2015).

J Grenfell, A Apeageyi, and G Airey, "Moisture damage assessment using surface energy, bitumen stripping and the SATS moisture conditioning procedure" *International Journal of Pavement Engineering*, 16(5): 411-431 (2015).

AK Apeageyi, JRA Grenfell, and GD Airey, "Application of Fickian and non-Fickian diffusion models to study moisture diffusion in asphalt mastics" *Materials and Structures*, 48(5): 1461-1474 (2015).

AA Kadam, T Karbowski, A Voilley, and F Debeaufort, "Techniques to measure sorption and migration between small molecules and packaging: A critical review" *Journal of the Science of Food and Agriculture*, 95(7): 1395-1407 (2015).

A Randova, L Bartovska, S Hovorka, M Kacirkova, H Vychodilova, Z Sedlakova, LOC Stasna, L Brozova, J Zitka, P Sysel, J Brus, P Drasar, and P Izak, "Sorption of enantiomers and alcohols into Nafion® and the role of air humidity in the experimental data evaluation" *Separation and Purification Technology*, 144: 232-239 (2015).

E Macchi, L Zema, A Maroni, A Gazzaniga, and LA Felton, "Enteric-coating of pulsatile-release HPC capsules prepared by injection molding" *European Journal of Pharmaceutical Sciences*, 70: 1-11 (2015).

M Intini, M Goldsworthy, S White, and CM Joppolo, "Experimental analysis and numerical modelling of an AQSOA zeolite desiccant wheel" *Applied Thermal Engineering*, 80: 20-30 (2015).

SK Bajpai, P Dehariya, and SPS Saggi, "Investigation of moisture sorption, permeability, cytotoxicity and drug release behavior of carrageenan/poly vinyl alcohol films" *Journal of Macromolecular Science A*, 52(4): 243-251 (2015).

O Koronthalyova, L Bagel, M Kuliffayova, and T Ifka, "Effect of presence of salt on hygric performance of ceramic bricks" *Transport in Porous Media*, 107(3): 667-682 (2015).

M Saeidpour and L Wadso, "Evidence for anomalous water vapor sorption kinetics in cement based materials" *Cement and Concrete Research*, 70: 60-66 (2015).

H Furuta, S Mori, Y Yoshihashi, E Yonemochi, H Uekusa, K Sugano, and K Terada, "Physicochemical and crystal structure analysis of pranlukast pseudo-polymorphs I: Anhydrates and hydrate" *Journal of Pharmaceutical and Biomedical Analysis*, 107: 11-16 (2015).

J Wang, P Lei, ZH Liu, P He, KM Wang, CB Liu, YK Chen, MM Miao, and CC LI, "Preparation, characterization and properties of cellulose acetate-grafted-poly(glycidyl





methacrylate) copolymers *Journal of Macromolecular Science A*, 52(3): 226-233 (2015).

J Biscarat, B Galea, J Sanchez, and C Pochat-Bohatier, **"Effect of chemical cross-linking on gelatin membrane solubility with a non-toxic and non-volatile agent: Terephthalaldehyde"** *International Journal of Biological Macromolecules*, 74: 5-11 (2015).

M Saeidpour and L Wadso, **"Moisture equilibrium of cement based materials containing slag or silica fume and exposed to repeated sorption cycles"** *Cement and Concrete Research*, 69: 88-95 (2015).

ZD Zhang, M Thiery, and V Baroghel-Bouny, **"Numerical modelling of moisture transfers with hysteresis within cementitious materials: Verification and investigation of the effects of repeated wetting-drying boundary conditions"** *Cement and Concrete Research*, 68: 10-23 (2015).

HY Chen, WL Wang, XL Wei, J Ding, and JP Yang, **"Experimental and numerical study on water sorption over modified mesoporous silica"** *Adsorption-Journal of the International Adsorption Society*, 21(1-2): 67-75 (2015).

YJ Chen, CY Liu, Z Chen, C Su, M Hageman, M Hussain, R Haskell, K Stefanski, and F Qian, **"Drug-polymer-water interaction and its implication for the dissolution performance of amorphous solid dispersions"** *Molecular Pharmaceutics*, 12(2): 576-589 (2015).

R Lamperti, J Genfell, C Sangiorgi, C Lantieri, and AG Airey, **"The influence of waxes on the adhesion properties of bituminous binders"** *Construction and Building Materials*, 76: 404-412 (2015).

G Flodberg, I Helland, L Thomsson, and SB Fredriksen, **"Barrier properties of polypropylene carbonate and poly(lactic acid) cast films"** *European Polymer Journal*, 63: 217-226 (2015).

AS Barham, F Tewes, and AM Healy, **"Moisture diffusion and permeability characteristics of hydroxypropylmethylcellulose and hard gelatin capsules"** *International Journal of Pharmaceutics*, 478(2): 796-803 (2015).

TT Yang and EN Ma, **"Dynamic sorption and hygroexpansion of wood subjected to cyclic relative humidity changes II. Effect of temperature"** *Bioresources*, 10(1): 1675-1685 (2015).

CM Popescu, CAS Hill, R Anthony, G Ormondroyd, and S Curling, **"Equilibrium and dynamic vapour water sorption properties of biochar derived from apple wood"** *Polymer degradation and stability*, 111: 363-368 (2015).

M Visanko, H Liimantainen, JA Sirvio, KS Mikkonen, M Tenkanen, R Sliz, O Hormi, and J Niinimäki, **"Butylamino-functionalized cellulose nanocrystal films: barrier properties and mechanical strength"** *RSC Advances*, 5(20): 15140-15146 (2015).

FH Liu, GP Han, WL Cheng, and QL Wu, **"Sorption isotherm of southern yellow pine-high density polyethylene composites"** *Materials*, 8(1): 368-378 (2015).

BB Pajarito and M Kubouchi, **"Moisture sorption of epoxy composites reinforced with aligned and notched triangular bars"** *Mechanics of Composite Materials*, 50(6): 789-800 (2015).

A Morandeau, M Thiery, and P Dangla, **"Impact of accelerated carbonation on OPC cement paste blended with fly ash"** *Cement and Concrete Research*, 67: 226-236 (2015).

CS Zhou, W Chen, W Wang, and F Skoczylas, **"Unified determination of relative molecular diffusivity and fluid permeability for partially saturated cement-based materials"** *Cement and Concrete Research*, 67: 300-309 (2015).

YP Tang, H Want, and TS Chung, **"Towards high water permeability in triazine-framework-based microporous membranes for dehydration of ethanol"** *CHEMSUSCHEM*, 8(1): 138-147 (2015).

MI Amaro, L Tajber, OI Corrigan, and AM Healy, **"Co-spray dried carbohydrate microparticles: Crystallisation through the incorporation of hydroxypropyl-beta-cyclodextrin with amorphous raffinose or trehalose"** *Pharmaceutical Research*, 32(1): 180-195 (2015).

W Willems, **"A critical review of the multilayer sorption models and comparison with the sorption site occupancy (SSO) model for wood moisture sorption isotherm analysis"** *HOLZFORSCHUNG*, 69(1): 67-75 (2015).

IGC SEA Articles:

M Wlazlo, A Marciniak, M Zawadzki, and B Dudkiewicz, **"Activity coefficients at infinite dilution and physicochemical properties for organic solutes and water in the ionic liquid 4-(3-hydroxypropyl)-4-methylmorpholinium bis(trifluoromethylsulfonyl)-amide"** *Journal of Chemical Thermodynamics*, 86: 154-161 (2015).

M Dimopoulou, C Ritzoulis, and C Panayiotou, **"Surface characterization of okra hydrocolloid extract by IGC"** *Colloids and Surfaces A*, 475: 37-43 (2015).

JF Dai, GJ Wang, L Ma, and CK Wu, **"Study on the surface energies and dispersibility of graphene oxide and its derivatives"** *Journal of Materials Science*, 50(11): 3895-3907 (2015).

M Ruckriem, D Enke, and T Hahn, **"IGC as a tool for an energetic characterisation of porous materials"** *Microporous and Mesoporous Materials*, 209: 99-104 (2015).

E Lukoshko, F Mutelet, and U Domanska, **"Experimental and theoretical study of interaction between organic compounds and tricyanmethane based ionic liquids"** *Journal of Chemical Thermodynamics*, 85: 49-56 (2015).

SC Zhang, LL Qin, F Liu, and JC Zhao, **"Characterization of the thermodynamic properties of 3-N-butyl-6-(1-decyl olefinic acid base)-4-cyclohexane diacid by IGC"** *Instrumentation Science & Technology*, 43(3): 334-343 (2015).

KT Heyder, MA Rahnama, A Sharif, M Mirzaei, and SH Ahmadi, **"Solvation parameter model and thermodynamic parameters in a dicationic ionic liquid based on pyrrolidinium"** *Journal of Chemical Thermodynamics*, 84: 101-107 (2015).

L Lapcik, B Lapcikova, E Otyepkova, M Otepka, J Viecek, F Bunka, and RN Salek, **"Surface energy analysis and**

rheology of powder milk dairy products” *Food Chemistry*, 174: 25-30 (2015).

D Gavril, “**CO oxidation on nanosized Au/Al₂O₃ by surface hydroxyl groups and in the absence of O₂, studied by IGC**” *Catalysis Today*, 244: 36-46 (2015).

TJ Sun, JL Hu, XY Ren, and DS Wang, “**Experimental evaluation of the adsorption, diffusion, and separation of CH₄-N₂ and CH₄/CO₂ mixtures on Al-BDC MOF**” *Separation Science and Technology*, 50(6): 874-885 (2015).

M Wlazo, A Marciniak, and TM Letcher, “**Activity coefficients at infinite dilution and physicochemical properties for organic solutes and water in the ionic liquid 1-ethyl-3-methylimidazolium trifluorotris(perfluoroethyl)phosphate**” *Journal of Solution Chemistry*, 44(3-4): 413-430 (2015).

E Nowak and AW Pacek, “**Method for the prediction of the particle attachment to the bubble in oil at elevated temperatures**” *Powder Technology*, 274: 105-111 (2015).

B Deepa, E Abraham, N Cordeiro, M Mozetic, AP Mathew, K Oksman, M Faria, S Thomas, and LA Pothan, “**Utilization of various lignocellulosic biomass for the production of nanocellulose: a comparative study**” *Cellulose*, 22(2):1075-1090 (2015).

Z Okulus, B Strzemieska, B Czarnańska, T Buchwald, and A Voelkel, “**Surface energy of bovine dentin and enamel by means of IGC**” *Materials Science & Engineering C*, 49:382-389 (2015).

S Couck, YY Liu, K Leus, GV Baron, P Van der Voort, and JPM Denayer, “**Gas phase adsorption of alkanes, alkenes and aromatics on the sulfone-DUT—5 Metal Organic Framework**” *Microporous and Mesoporous Materials*, 206:217-225 (2015).

JAF Gamelas, J Pedrosa, AF Lourenco, and PJ Ferreira, “**Surface properties of distinct nanofibrillated celluloses assessed by IGC**” *Colloids and Surfaces A*, 469: 36-41 (2015).

R Ho, Y Sun, and B Chen, “**The impact of moisture and plasticizer properties on polymer-plasticizer physical mixing performance**” *Journal of Applied Polymer Science*, 132(12):41679 (2015).

S Sharif, LM DiMemmo, M Thommes, M Hubert, and BA Sarsfield, “**A simplified approach to determine effective surface area and porosity of low bulk density active pharmaceutical ingredients in early development**” *Advanced Powder Technology*, 26(2): 337-348 (2015).

G Keru, PG Ndungo, and VO Nyamori, “**Effect of boron concentration on physicochemical properties of boron-doped carbon nanotubes**” *Materials Chemistry and Physics*, 153:232-332 (2015).

I Gutierrez, E Diaz, A Vega, S Ordonez, A Guerrero-Ruiz, E Castillejos-Lopez, and I Rodriguez-Ramos, “**Hydrocarbons adsorption on metal trimesate MOFs: IGC and immersion calorimetry studies**” *Thermochimica Acta*, 602: 36-42 (2015).

N Arsalan, JJ Buiting, and QP Nguyen, “**Surface energy and wetting behavior of reservoir rocks**” *Colloids and Surfaces A*, 467: 107-112 (2015).

F Mutelet, P Carre, and A Skrzypczak, “**Study of interactions between organic compounds and mono or**

dicationic oxygenated liquids using IGC” *Fluid Phase Equilibria*, 387: 59-72 (2015).

JF Dai, GJ Wang, L Ma, and CK Wu, “**Surface properties of graphene: relationship to graphene-polymer composites**” *Reviews on Advanced Materials Science*, 40(1): 60-71 (2015).

E Zuzza, A Lejardi, E Meaurio, and JR Sarasua, “**Phase behavior and interactions in poly(DL-lactide)/poly(styrene-co-vinylphenol) blends**” *European Polymer Journal*, 63: 58-66 (2015).

A Tamayo, A Aires-Trapote, F Rubio, MJ Hernaiz, A Rumbero, and J Rubio, “**Effect of the surface parameters on the interaction of epoxy polymer supports with lipase enzyme**” *Polymer Bulletin*, 72(2): 195-218 (2015).

LM Ombaka, PG Ndungu, and VO Nyamori, “**Tuning the nitrogen content and surface properties of nitrogen-doped carbon nanotubes synthesized using nitrogen-containing ferrocenyl derivative and ethylbenzoate**” *Journal of Materials Science*, 50(3): 1187-1200 (2015).

JMRCA Santos and JT Guthrie, “**Lewis acid/base character and crystallisation properties of poly(butylene terephthalate)**” *Journal of Chromatography A*, 1379: 92-99 (2015).

T Belin, N Batalha, L Pinard, F Lemos, and Y Pouilloux “**Interactions of H₂ on the isobutene adsorption over bifunctional catalyst PthBEA revealed by reversed-flow IGC**” *Journal of Physical Chemistry C*, 119(4): 1791-1799 (2015).

E Rojo, MS Peresin, WW Sampson, IC Hoeger, J Vartiainen, J Laine, and OJ Rojas, “**Comprehensive elucidation of the effect of residual lignin on the physical, barrier, mechanical and surface properties of nanocellulose films**” *Green Chemistry*, 17(3): 1853-1866 (2015).

R Rajkhowa, A Kafi, QT Zhou, A Kondor, DAV Morton, and XG Wang, “**Relationship between processing, surface energy and bulk properties of ultrafine silk particles**” *Powder Technology*, 270: 112-120 (2015).

V Ramachandran, D Murnane, RB Hammond, J Pickering, KJ Roberts, M Soufian, B Forbes, S Jaffari, GP Martin, E Collins, and K Pencheva, “**Formulation pre-screening of inhalation powders using computational atom-atom systematic search method**” *Molecular Pharmaceutics*, 12(1): 18-33 (2015).

MM Batista, R Guirardello, and MA Krahenbuhl, “**Determination of the Hansen solubility parameters of vegetable oils, biodiesel, diesel, and biodiesel blends**” *Journal of the American Oil Chemists Society*, 92(1): 95-109 (2015).



SMS Publications:

"Evaluation of protein hydration by Inverse Gas Chromatography (IGC SEA) and Dynamic Vapor Sorption (DVS)" SMS Case Study 617.

Upcoming Conferences

Society of Wood Science and Technology: Grand Teton National Park, Wyoming, USA; 07-12 June 2015; Exhibitor and Presenter.

North American Meeting of the Catalysis Society: Pittsburgh, PA, USA; 14-19 June 2015; Exhibitor and Presenter.

ACHEMA: Frankfurt, Germany; 15-19 June 2015; Exhibitor.

ICBBM Bio Based Building Materials: Clearmont, France; 21-23 June 2015; Exhibitor and Presenter.

7th International Granular Workshop: Sheffield, UK; 29-30 June 2015; Exhibitor and Presenter.

IFT: Chicago, IL, USA; 11-14 July 2015; Exhibitor.

Carbon 2015: Dresden, Germany; 12-17 July 2015; Exhibitor and Presenter.

ICCM-20: Copenhagen, Denmark; 19-24 July 2015; Exhibitor.

12th Int'l Conference on Materials Chemistry: York, UK; 20-23 July 2015; Exhibitor.

Gordon Research Conferences on Nanoporous Materials and Their Applications: Holderness, NH, USA; 9-14 August 2015; Presenter.

ACS National Meeting: Boston, MA, USA; 16-20 August 2015; Presenter.

APS PharmSci Conference: Nottingham, UK; 7-9 September 2015; Exhibitor and Presenter.

Polymer Processing Society: Graz, Austria; 21-25 September 2015; Exhibitor and Presenter.

Euro MOF: Berlin, Germany; 12-14 October 2015; Exhibitor.

AAPS Annual Meeting: Orlando, FL, USA; 26-30 October 2015; Exhibitor and Presenter.

SMS Training

USA Office: 09 September 2015 (DVS) and 10 September 2015 (IGC-SEA); Allentown, PA; Email Science@surfacemeasurementsystems.com for details.

UK Office: 16 September 2015 (DVS) and 17 September 2015 (IGC-SEA); Alperton, London; Email Science@surfacemeasurementsystems.com for details.

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