



November 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:

GM Kelly, JA O'Mahony, AL Kelly, T Huppertz, D Kennedy, and DJ O'Callaghan, "Influence of protein concentration on surface composition and physico-chemical properties of spray-dried milk protein concentrate powders" *International Dairy Journal*, 51: 51-34 (2015).

M Kymalainen, L Rautkari, and CAS Hill, "Sorption behaviour of torrefied wood and charcoal determined by DVS" *Journal of Materials Science*, 50(23): 7673-7680 (2015).

AG Tershchenko, "Deliquescence: Hygroscopicity of water-soluble crystalline solids" *Journal of Pharmaceutical Sciences*, 104(11): 3639-3652 (2015).

D Snoeck, LF Velasco, A Mignon, S Van Vlierbarghe, P Dubruel, P Lodewyckx, and N De Belie, "The effects of superadsorbent polymers on the microstructure of cementitious materials studied by means of sorption experiments" *Cement & Concrete Research*, 77: 26-35 (2015).

K Prakobna, V Kisonen, CL Xu, and LA Berglund, "Strong reinforcing effects from galactoglucomannan hemicellulose on mechanical behavior of wet cellulose nanofiber gels" *Journal of Materials Science*, 50(22): 7413-7423 (2015).

A Perez, I Melendez, I Vera, A Cova, AJ Sandoval, and AJ Muller, "Thermal and tensile properties of corn semolina-protein blends in the glassy state" *Journal of Food Engineering*, 165: 93-103 (2015).

P Yogendrarajah, S Samapundo, F Devlieghere, S De Saeger, and B De Muelenaer, "Moisture sorption isotherms and thermodynamic properties of whole black peppercorns (*Piper nigrum* L.)" *Food Science and Technology*, 64(1): 177-188 (2015).

R Pande and HN Mishra, "Influence of microwave heating on moisture sorption isotherm and drying characteristics of green gram (*Vigna radiate*) seeds

Journal of Food Processing and Preservation, 39(5): 458-468 (2015).

R Lemus-Mondaca, A Vega-Galvez, NO Moraga, and S Astudillo, "Dehydration of SteviareBertoni leaves: Kinetics, modeling and energy features" *Journal of Food Processing and Preservation*, 39(5): 508-520 (2015).

MP Singh, SK Kanawjia, A Giri, and Y Khetra, "Effect of temperature and microcrystalline cellulose on moisture sorption characteristics of shredded mozzarella cheese" *Journal of Food Processing and Preservation*, 39(5): 521-529 (2015).

HJ Kang, MY Won, LJ Lee, and SC Min, "Plasticization and moisture sensitivity of potato peel-based biopolymer" *Food Science and Biotechnology*, 24(5): 1703-1710 (2015).

A Ebrahimi, M Saffari, and T Langrish, "Spray drying and post-processing production of highly-porous lactose particles using sugars as templating agents" *Powder Technology*, 283: 171-177 (2015).

XB Zhang, W Zillig, HM Kunzel, X Zhang, and C Mitterer, "Evaluation of moisture sorption models and modified Mualem model for prediction of desorption isotherm for wood materials" *Building and Environment*, 92: 387-395 (2015).

R Altamirano-Fortoul, P Hernandez-Munoz, I Hernando, and CM Rosell, "Mechanical, microstructure and permeability properties of a model bread crust: Effect of different food additives" *Journal of Food Engineering*, 163: 25-31 (2015).

F Ansari, M Skrifvars, and L Berglund, "Nanostructured biocomposites based on unsaturated polyester resin and a cellulose nanofiber network" *Composites Science and Technology*, 117: 298-306 (2015).

B Goncalves, D Till, O Fasina, B Tamang, and T Gallagher, "Influence of bark on the physical and thermal decomposition properties of short-rotation eucalyptus" *Bioenergy Research*, 8(3): 1414-1423 (2015).

NR Panjagari, AK Singh, S Ganguly, and KP Indumati, "Beta-glucan rich composite flour biscuits: modelling of





moisture sorption isotherms and determination of sorption heat *Journal of Food Science and Technology*, 52(9): 5497-5509 (2015).

GKP de Araujo, SJ de Souza, MV da Silva, F Yamashita, OH Goncalves, FV Leimann, and MA Shirai, "**Physical, antimicrobial and antioxidant properties of starch-based film containing ethanolic propolis extract**" *International Journal of Food Science and Technology*, 50(9): 2080-2087 (2015).

Q Zeng, DD Zhang, and KF Li, "**Kinetics and equilibrium isotherms of water vapor adsorption/desorption in cement-based porous materials**" *Transport in Porous Media*, 109(2): 469-493 (2015).

DA Pai, VR Vangala, JW Ng, WK Ng, and RBH Tan, "**Resistant maltodextrin as a shell material for encapsulation of naringin: Production and physicochemical characterization**" *Journal of Food Engineering*, 161: 68-74 (2015).

FM Preda, A Alegria, A Bocahut, LA Fillott, DR Long, and P Sotta, "**Investigation of water diffusion mechanisms in relation to polymer relaxations in polyamides**" *Macromolecules*, 48(16): 5730-5741 (2015).

T Muller, R Scherliess, J Schiewe, R Smal, C Weiler, H Steckel, "**Applicability of the one-step DVS method for the determination of amorphous amounts for further different hydrophilic and hydrophobic drugs**" *European Journal of Pharmaceutics and Biopharmaceutics*, 94: 333-341 (2015).

P Hazaveh, AM Nafchi, and H Abbaspour, "**The effects of sugars on the moisture sorption isotherm and functional properties of cold water fish gelatin films**" *International Journal of Biological Macromolecules*, 79: 370-376 (2015).

RC Chiste, JM Cardoso, DA da Silva, and RD Pena, "**Hygroscopic behaviour of cassava flour from dry and water groups**" *Ciencia Rural*, 45(8): 1515-1521 (2015).

N Doroudgarian, L Pupure, and R Joffe, "**Moisture uptake and resulting mechanical response of bio-based composites. II. composites**" *Polymer Composites*, 36(8): 1510-1519 (2015).

MP Rascon, E Bonilla, H Garcia, MA Salgado, MT Gonzalez-Arnao, and CI Beristain, "**T(g) and a(w) as criteria for the oxidative stability of spray-dried encapsulated paprika oleoresin**" *European Food Research and Technology*, 241(2): 217-225 (2015).

M Erber and G Lee, "**Cryopellets based on amorphous organic calcium salts: Production, characterization and their usage in coagulation diagnostics**" *Powder Technology*, 280: 10-17 (2015).

FS Thomann, MR Hall, W Sangchoom, and R Mokaya, "**A hygrothermal modelling approach to water vapour sorption isotherm design for mesoporous humidity buffers**" *Microporous and Mesoporous Materials*, 211: 113-123 (2015).

K Nawaz, SJ Schmidt, and AM Jacobi, "**A parametric study on mass diffusion coefficient of desiccants for dehumidification applications: Silica aerogels and silica aerogel coatings on metal foams**" *Science and Technology for the Built Environment*, 21(5): 637-647 (2015).

IGC SEA Articles:

SA Hogan, IB O'Loughlin, and PM Kelly, "**Soft matter characterization of whey protein systems**" *International Dairy Journal*, 52: 1-9 (2015).

A Chen, I Blakey, KS Jack, AK Whittaker, and H Pent, "**Control through monomer placement of surface properties and morphology of fluoromethacrylate copolymers**" *Journal of Polymer Science A*, 53(22): 2633-2641 (2015).

A Kondor, C Quellet, and A Dallos, "**Surface characterization of standard cotton fibres and determination of adsorption isotherms of fragrances by IGC**" *Surface and Interface Analysis*, 47(11): 1040-1050 (2015).

P Lazar, E Otyepkova, F Karlicky, K Cepe, and M Otyepka, "**The surface and structural properties of graphite fluoride**" *Carbon*, 94: 804-809 (2015).

MG Cares-Pacheco, R Calvet, G Vaca-Medina, A Rouilly, and F Espitalier, "**IGC as a tool to follow physicochemical modifications of pharmaceutical solids: Crystal habit and particles size surface effects**" *International Journal of Pharmaceutics*, 494(1): 113-126 (2015).

Y Yampolskii and N Belov, "**Investigation of polymers by IGC**" *Macromolecules*, 48(19): 6751-6767 (2015).

A Marciniak and M Wlazlo, "**Activity coefficients at infinite dilution, physicochemical and thermodynamic properties for organic solutes and water in the ionic liquid ethyl-dimethyl-(2-methoxyethyl)ammonium trifluorotris-(perfluoroethyl)phosphate**" *Journal of Chemical Thermodynamics*, 89: 245-250 (2015).

JF Xu, MM Shao, ZM Ni, and XC Xiao, "**Surface properties of magnesium-iron hydrotalcite and its modified products by IGC**" *Journal of Inorganic Materials*, 30(9): 971-976 (2015).

G Autie-Castro, MA Autie, E Rodriguez-Castellon, C Aguirre, and E Reguera, "**Cu-BTC and Fe-BTC MOFs: Role of the materials structural features on their performance for volatile hydrocarbons separation**" *Colloids and Surfaces A*, 481: 351-357 (2015).

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F Karlicky, E Otyepkova, P Banas, P Lazar, M Kocman, and M Otyepka, "**Interplay between ethanol adsorption to high-energy sites and clustering on graphene and graphite alters the measured isothermic adsorption enthalpies**" *Journal of Physical Chemistry C*, 119(35): 20535-20543 (2015).

YC Peng and DJ Gardner, "**Surface energy of cellulosic materials: The effect of particle morphology, particle size, and hydroxyl number**" *TAPPI Journal*, 14(9): 565-576 (2015).

PM Słomkiewicz, B Szczepanik, and M Garnuszek, "**Determination of adsorption isotherms of aniline and 4-chloroaniline on halloysite adsorbent by inverse liquid chromatography**" *Applied Clay Science*, 114: 221-228 (2015).

L Boudriche, R Calvet, A Chamayou, B Hamdi, and H Balard, "**Removal of lead(II) from aqueous solution using**



modified palygorskite, contribution of IGC *Journal of Chromatography*, 1408:207-216 (2015).

MA Mohammad, "An equation to calculate the actual methylene middle parameter as a function of temperature" *Journal of Chromatography A*, 1408: 267-271 (2015).

JAF Gamelas and AG Martins, "Surface properties of carbonated and non-carbonated hydroxyapatites obtained after bone calcination at different temperatures" *Colloids and Surfaces A*, 478: 62-70 (2015).

L Lapcik, M Vasina, B Lapcikova, E Otyepkova, and KE Waters, "Investigation of advanced mica powder nanocomposite filler materials: Surface energy analysis, powder rheology and sound absorption performance" *Composites Part B*, 77: 304-310 (2015).

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EO Oseghe, PG Ndungu, and SB Jonnalagadda, "Synthesis, characterization, and application of TiO₂ nanoparticles – Effect of pH adjusted solvent" *Journal of Advanced Oxidation Technologies*, 18(2): 253-263 (2015).

W Zhang, NX Wang, SL Ji, and JD Li, "Solution and diffusion properties of organic sulfur in poly[bis(phenoxy)phosphazene] by IGC" *Journal of Industrial and Engineering Chemistry*, 27: 341-346 (2015).

T Wu, NX Wang, J Li, L Wang, W Zhang, GJ Zhang, and SL Ji, "Tubular thermal crosslinked-PEBA/ceramic membrane for aromatic/aliphatic pervaporation" *Journal of Membrane Science*, 486: 1-9 (2015).

ZT Yao, LQ Ge, WY Yang, MS Xia, XS Ji, MQ Jin, JH Tang, and J Dienstmaier, "Finite dilution IGC as a versatile tool to determine the surface properties of biofillers for plastic composite applications" *Analytical Chemistry*, 87(13): 6724-6729 (2015).

S Ramanaiah, BP Kumar, and P Venkateswarlu, "Surface thermodynamics of poly(caprolactone) diol by IGC" *International Journal of Polymer Analysis and Characterization*, 20(5): 414-425 (2015).

L Assumma, HD Nguyen, C Iojoiu, S Lyonnard, R Mercier, and E Espuche, "Effects of block length and membrane processing conditions on the morphology and properties of perfluorosulfonated poly(arylene ether sulfone) multiblock copolymer membranes for PEMFC" *ACS Applied Materials & Interfaces*, 7(25): 13808-13820 (2015).

LJ Jallo and RN Dave, "Explaining electrostatic charging and flow of surface-modified acetaminophen powders as a function of relative humidity through surface energetics" *Journal of Pharmaceutical Sciences*, 104(7): 2225-2232 (2015).

MA Mohammad, "Accuracy verification of surface energy components measured by IGC" *Journal of Chromatography A*, 1399: 88-93 (2015).

BH Zhong and ZY Al-Saigh, "Characterization of biodegradable polymers by IGC: IV, blends of amylopectin and poly ((L)-lactide-co-caprolactone-co-glycolide)" *European Polymer Journal*, 67: 174-185 (2015).

L Yang, Q Han, S Cao, F Huang, ML Qin, CH Guo, and MY Ding, "Research on the interaction of hydrogen-bond acidic polymer sensitive sensor materials with chemical warfare agents simulants by IGC" *Sensors*, 15(6): 12884-12890 (2015).

O Yazici and F Karaman "Determination of surface energies and acidity-basicity numbers of protonated and deprotonated forms of poly(sulfonic acid diphenyl aniline) by IGC" *Polymer Engineering and Science*, 55(6): 1246-1254 (2015).

MD Ticehurst and I Marziano, "Integration of active pharmaceutical ingredient solid form selection and particle engineering into drug product design" *Journal of Pharmacy and Pharmacology*, 67(6): 782-802 (2015).

V Karde and C Ghoroi, "Fine powder flow under humid environmental conditions from the perspective of surface energy" *International Journal of Pharmaceutics*, 485(1-2): 192-201 (2015).



SMS Publications:

“Characterization of Structural and Stereo Isomeric Amino Acids Using Raman Spectroscopy and Vapour Sorption Techniques” *SMS Case Study 618.*

“Reproducibility of the BET Specific Surface Area and the Dispersive Component of Surface Energy Measured by Inverse Gas Chromatography. Part I: Energetically Homogenous Powders” *SMS Technical Note 806.*

Upcoming Conferences

Philadelphia Catalyst Group Zeolite Meeting:

Philadelphia, PA, USA; December 2015; Attendee.

SMS Training

USA Office: 10 May 2016 (DVS) and 11 May 2016 (IGC-SEA); Allentown, PA; Email Science@surfacemeasurementsystems.com for details.

UK Office: 18 May 2016 (DVS) and 19 May 2016 (IGC-SEA); Alpertown, London; Email Science@surfacemeasurementsystems.com for details.

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