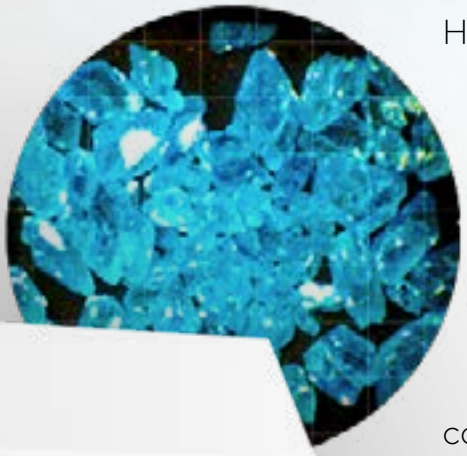
ANALYZER
HIDEN ISOCHEMA NEWSLETTER
ISSUE 06
SPRING 2019

HIDEN ISOCHEMA

NEW

Advanced video microscope option for IGAsorp DVS Analyzer



Hiden Isochema's IGAsorp dynamic vapor sorption (DVS) analyzer is now available with a video microscope for high resolution in situ image capture between 5 and 350 °C. This option facilitates the study of phase changes in precisely controlled thermal ramp or steady state conditions including dehydration-rehydration and deliquescence.

The IGAsorp's camera option allows simultaneous high resolution image collection with vapor sorption and TGA measurements to 350 °C, and is compatible with both water and organic vapors. The high resolution video microscope features LED illumination, adjustable magnification to 220x and a built-in polarizer.

An all-new software interface offers complete control of the video microscope from the IGAsorp's HIsorp software with full colour images recorded either at defined time intervals or at particular stages in the method. Real time image display is integrated with the gravimetric data and replay options include time lapse video presentation mode.

DOWNLOAD NOW!

hidenisochema.com /IGAsorp

NEED MORE DETAILS GET IN TOUCH!

HIDEN SUPPORTED PROJECT

The Shiflett Research Group in the Department of Chemical and Petroleum Engineering at University of Kansas recently published two comprehensive research articles reporting gas and vapor solubility and diffusivity measurements in ionic liquids

publish

Industr

Chemi

report

data m

Isoche

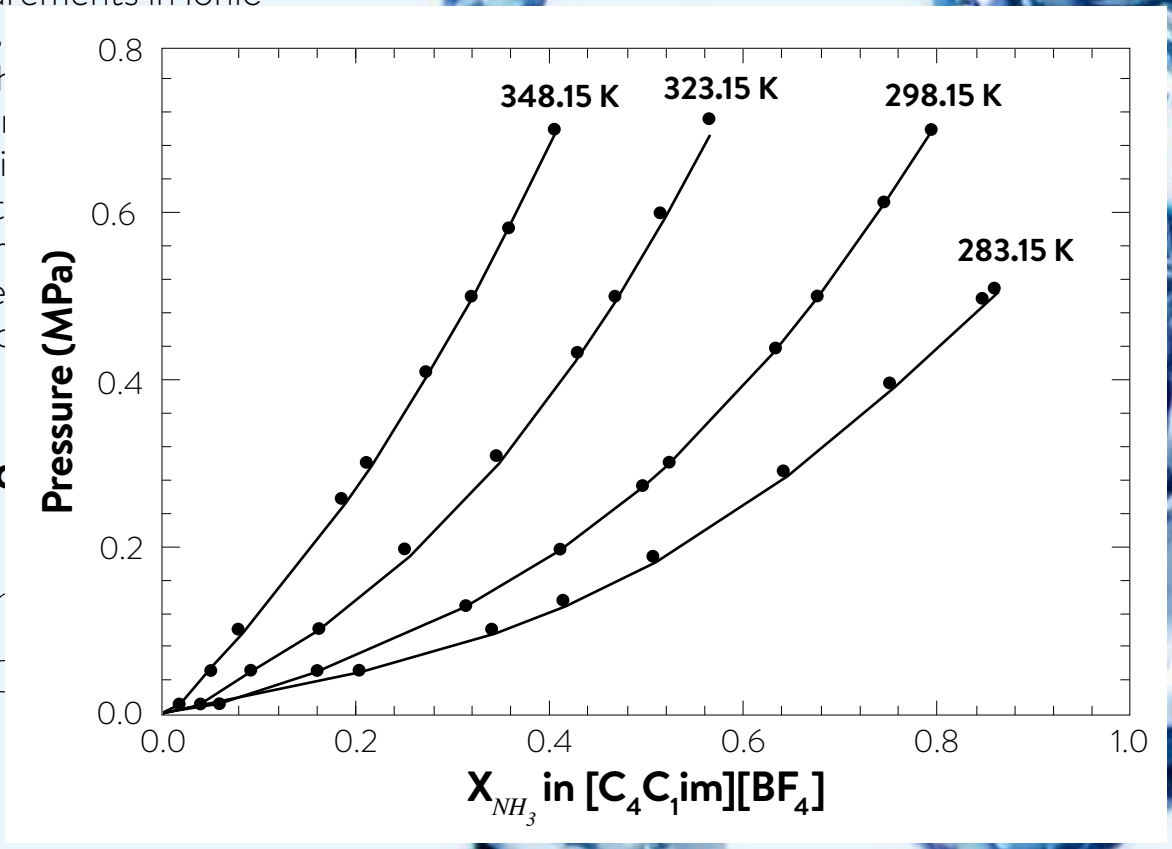
sorptic

"The

the

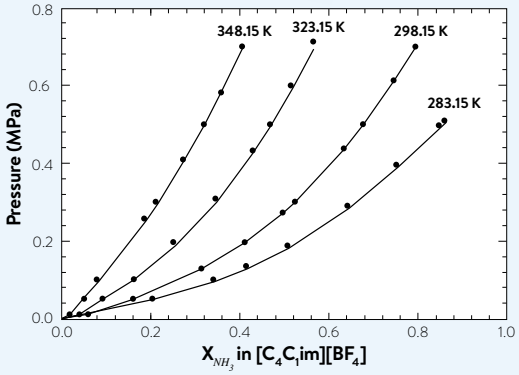
tech

sorp



Ammonia and water solubility and diffusivity in ionic liquids:

Thermodynamics & Kinetics

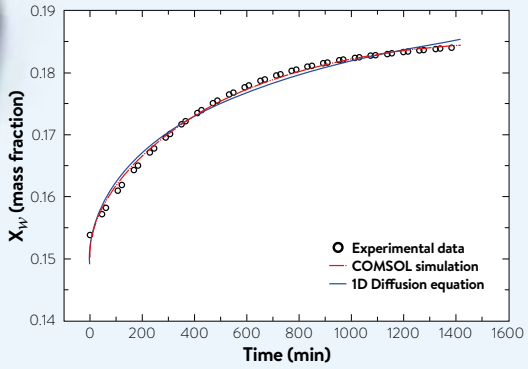


Ammonia solubility data in $[C_4C_1im][BF_4]$ at four temperatures. Lines represent PR-EoS phase diagram model.

[1] T. Turnaoglu and M. B. Shiflett, Ind. Eng. Chem. Res. (2019) 58, 4644-4655. DOI: 10.1021/acs.iecr.9b00274
[2] M A. Rocha and M. B. Shiflett, Ind. Eng. Chem. Res. (2019) 58, 1743-1753. DOI: 10.1021/acs.iecr.8b05689

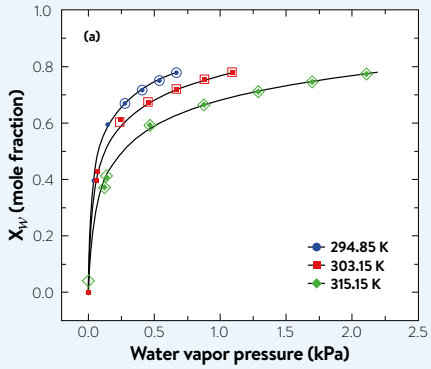
In "The First Thermodynamic and Kinetic Analysis of Ammonia in Imidazolium Based Ionic Liquids using a Gravimetric Microbalance"[1] the authors describe ammonia solubility measurements in three different ionic liquids, at four temperatures in the range 10 to 75 °C, at NH_3 pressures up to 7 bar. A **XEMIS-001** gravimetric sorption analyzer, which was previously validated against benchmark results for CO_2 solubility in a reference ionic liquid, was used for all measurements. Equilibrium vapor liquid equilibrium (VLE) results were correlated against equation of state and activity coefficient models, with excellent agreement. Fickian diffusion coefficients were extracted from the gravimetric kinetic data, which is recorded simultaneously with the equilibrium sorption data.

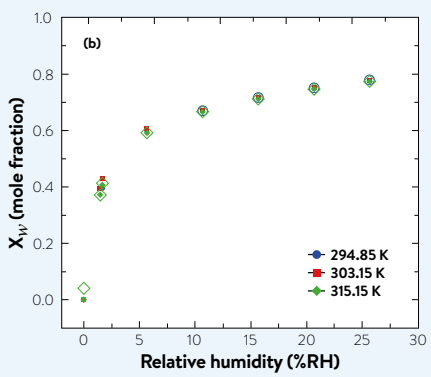
A few weeks earlier, the Shiflett group reported a comprehensive study of water solubility and diffusivity in several imidazolium based ionic liquids[2] using an **IGAsorp**. Initial results for water solubility in an ionic liquid previously studied by another group were used to validate the instrument and method, with close agreement. Water solubility measurements for three different imidazolium based ionic liquids, at several temperatures between 10 and 42 °C, are reported and the data compared with a non-random two liquid (NRTL) solution model. The equilibrium results were also used to determine the enthalpy of absorption for each system as a function of the water mole fraction. The gravimetric sorption kinetics were evaluated to determine water diffusivity in the ionic liquids. The measured time dependent data correlates well with models even for the longest equilibration times (in excess of 50 hours), demonstrating the excellent long-term stability of the IGAsorp.



Example water solubility (diffusion) kinetics for 15% RH, 294.85 K data point from data below.
Reprinted (adapted) with permission from M A. Rocha and M. B. Shiflett, Ind. Eng. Chem. Res. (2019) 58, 1743-1753. © 2019 American Chemical Society.

Absorption/desorption isotherms of water in [C_4C_1im][OAc] at various temperatures as a function of partial pressure of water (a) and as a function of relative humidity (b). Filled symbols represent absorption and open symbols represent desorption.
Reprinted (adapted) with permission from M A. Rocha and M. B. Shiflett, Ind. Eng. Chem. Res. (2019) 58, 1743-1753. © 2019 American Chemical Society.





Deadline approaches for International Gas Adsorption Summer School applications

The 1st International Gas Adsorption Summer School (I-GASS), to be held in Spetses, Greece between 9th and 14th September 2019, is currently accepting applications from potential delegates.

Applications can be made via the website i-gass.gr and the closing date is 15th May. Hiden Isochema are proud to sponsor the summer school and encourage any customers new to the field to consider applying to attend.

Full details including the latest updates are available on the I-GASS website (i-gass.gr) and at twitter.com/igass2019.

Discovering more. seeing more.

DATE	CONFERENCE	LOCATION
31 March - 4 April	ACS Spring Meeting	Orlando, USA
11-12 April	BZA Annual Meeting	Birmingham, UK
30 April - 1 May	Making Pharmaceuticals	Coventry, UK
6-10 May	Interpore Annual Meeting	Valencia, Spain
11-15 May	NAMS 2019	Pittsburgh, USA
26-31 May	FOA13 (Fundamentals of Adsorption)	Cairns, Australia
30 June - 5 July	Gordon Research Conference on Hydrogen - Metal Systems	Castelldefels, Spain
1-2 July	UK Porous Materials Conference	Cardiff, UK
7-12 July	19th International Zeolite Conference	Perth, Australia
8-11 July	MC14 (RSC Materials Chemistry)	Birmingham, UK
14-19 July	Carbon 2019	Kentucky, USA
8-11 Sept	ILSEPT-4	Sitges, Spain
9-10 Sept	39th Cement and Concrete Science Conference	Bath, UK
9-14 Sept	I-GASS Summer School	Spetses Island, Greece
27-30 Oct	EuroMOF	Paris, France
10-15 Nov	AIChE Annual Meeting	Boston, USA

RSC Porous Materials Group officially launched!

A new Royal Society of Chemistry (RSC) interest group has been launched: the Porous Materials Group.

The group has been formed for scientists from academic and commercial settings involved in research into all types of porous materials and now has its own page on the **rsc.org** website. The group also organises the annual UK Porous Materials Conference, this year to be held in Cardiff, see **ukpormat.com** for further details.

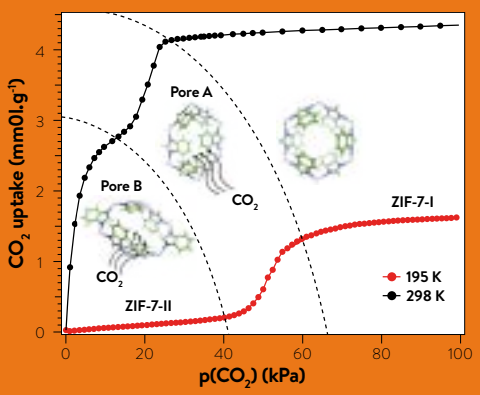
PUBLICATION ROUND-UP

MOF flexibility

Structural dynamics of a metal–organic framework induced by CO_2 migration in its non-uniform porous structure.

P. Zhao, H. Fang, S. Mukhopadhyay, A. Li, S. Rudić, I. J. McPherson, C. C. Tang, D. Fairez-Jimenez, S. C. E. Tsang and S. A. T. Redfern.

Nature Communications (2019) 10, 999. DOI: 10.1038/s41467-019-08939-y.



A recent study describes CO_2 adsorption by a flexible MOF, ZIF-7, and the effect on the structure of the MOF. The authors used an IGA-001 to measure high resolution CO_2 sorption isotherms at several temperatures, and a number of X-ray and neutron based methods to evaluate the structural dynamics of the material. The authors conclude that the MOF's structural change, induced by CO_2 adsorption and exhibited by an abrupt increase in CO_2 sorption capacity between 40 and 60 kPa at 298 K, is due to CO_2 migration rather than a pore opening mechanism. CO_2 sorption at 195 K exhibits a two stage adsorption process, the second of which is correlated with the ZIF-7 phase change. The authors comment that the dynamics observed for the CO_2 /ZIF-7 system provides a new insight into the phenomenon of MOF flexibility.

MOF synthesis

Capturing chemical intuition in synthesis of metal-organic frameworks.

S. M. Moosavi, A. Chidambaram, L. Talirz, M. Haranczyk, K. C. Stylianou and B. Smit.

Nature Communications (2019) 10, 539. DOI: 10.1038/s41467-019-08483-9.

The synthesis of metal-organic frameworks (MOFs) is dependent on often subtle variations in conditions, which are generally determined experimentally but is also by the chemical intuition of synthetic chemists. The authors of this study suggest that machine learning from a body of both successful and 'failed' or partially successful syntheses can be used to predict the optimal synthesis conditions more efficiently. As a case study, robotic synthesis of MOF HKUST-1 was performed using a range of different conditions and the resulting material characterised using analytical methods including gas sorption using an IGA-001 to determine the BET surface area, which is used as an initial indicator for a successful synthesis. The results are used to provide "learnt chemical intuition" which was then applied to refine the synthesis of HKUST-1 with the highest yet reported surface area. The learnt chemical intuition was then applied to synthesis of a related but different MOF to demonstrate how synthesis could be significantly streamlined in the future.

Hiden Isochema Limited
422 Europa Boulevard, Warrington WA5 7TS
Tel: +44 (0) 1925 244 678 info@hidenisochema.com