July 6th, 2013, Bremen, Germany

Minutes of the 13th IATP Meeting

1. INTRODUCTION

The meeting was opened by the Chairman, Prof. Sir William Wakeham, who welcomed all present and thanked Dr Bernd Rathke for the excellent arrangements as the local organiser of the meeting.

The meeting was divided into the usual scientific session and business session. The proceedings are recorded here in that order.

2. SCIENTIFIC SESSION

2.1. Simultaneous Determination of Mutual and Thermal Diffusivity in Liquids with Dissolved Gases by Dynamic Light Scattering (DLS)
A. Heller, M. H. Rausch, and A.P. Fröba (Germany).

2.2. Accurate Determination of Binary Diffusion Coefficients for Gas Mixtures Using a Loschmidt Cell Combined with Holographic Interferometry
T. Kugler, M.H. Rausch, and A.P. Fröba (Germany).

2.3. Viscosity Measurements on Solutions of Ionic Liquids in the vicinity of the Upper Critical Solution Point
D. Saracsan, V. Vale, A. Butka, J. Koeser, A. Elshwishin, W. Schröer (Germany).

2.4. Measuring the Viscosity of High-Viscosity Liquids
S.K. Mylona, M.J. Assael (Greece).

2.5. Portable Transient-Hot Wire Instrument for Solids
S. Tsiglifisi, K. Antoniadis, S.K Mylona, J.A.M. Assael, M.J. Assael (Greece), J.T. Wu (P.R. China)

2.6. The General Phase Behavior of CnmimNTf2 / *n*-Alkylalcohol Systems
X. Shao, W. Schröer, B. Rathke (Germany).

2.7. The Viscosity of Alkane Mixtures: Predictions Using the VW Method and its Use in Data Assessment
N. Riesco and V. Vesovic (U.K.).

2.8. On the Diffusion of Particles under Confinement of a Porous Glass
B.Over , B. Rathke, S. Will (Germany).

2.9. Calculation of the Transport Properties of a Dilute Gas Consisting of Lennard-Jones Chains
R. Hellmann (Germany), N. Riesco, V. Vesovic (U.K.)

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2.10. Recent developments and applications of the kinetic theory of dilute gas mixtures
E. Bich, R. Hellmann, B. Jäger (Germany).

2.11. Ethane: a Viscosity Surface Correlation Convenient for Engineers
E. Vogel and S. Herrmann (Germany).

2.12. Reference Correlation of the Thermal Conductivity and Viscosity of *n*-Hexane
S.K. Mylona, E. Michailidou, M.J. Assael (Greece), M. Huber, R. Perkins (U.S.A.).

2.13. The Frits-Riddle - The Solution
U. Hammerschmidt (Germany)

Each presentation engendered discussion and a few points of special interest are noted here:

- Mr A. Heller showed results of thermal and mutual diffusivity of gases dissolved in liquids, e.g., for mixtures of ionic liquids with CO_2. In many cases, both properties could be measured simultaneously in a broad temperature and pressure range
- Ms T. Kugler presented recent advances as well as problems associated with the accurate determination of binary diffusion coefficients for gas mixtures using a Loschmidt Cell combined with holographic interferometry
- Dr W. Schröer discussed observations in viscosity measurements on solutions of ionic liquids showing Ising like behavior in the vicinity of the upper critical solution point
- Ms S. Mylona presented a new vibrating wire viscometer for measuring the viscosity of high-viscosity fluids up to 20 MPa. An update on the progress of the portable transient-hot wire instrument for solids was also presented.

On the theoretical side

- Dr B. Rathke presented progress achieved in describing the general phase behavior of CnmimNTf2 / n-alkyl alcohol systems.
- Dr N. Riesco discussed the need for defining a selection of reference data to validate mixture theories.
- Mr B. Over discussed the dependence of the diffusion coefficient of particles under confinement of porous glass, upon particle and pore size.
- Prof. V. Vesovic discussed effects of molecular chain length, on rotational relaxation and in the calculation of transport properties of a dilute gas consisting of L-J chains.
- Mr B. Jäger discussed recent developments and applications of the kinetic theory of dilute gas mixtures as well as the development of an *ab initio* pair potential for some unlike molecules
- Prof. E. Vogel presented new measurements of viscosity and density of ethane. With these data, and the approach to the critical region of Bhattacharjee *et al.* [1981], he was to correlate much better the viscosity measurements of ethane over gas, liquid and critical region.
- Ms Mylona presented recent work in cooperation with NIST, concerning reference correlations for the thermal conductivity and the viscosity of n-hexane covering the vapor, liquid and critical regions.
- Dr U. Hammerschmidt discussed the Woodside-Messmer effect observed in Sander sandstone (known as the Frits-Riddle) and reinterpreted it, in terms of the temperature jump effect.

3. BUSINESS SESSION

3.1. PROJECTS CONCLUDED

The following projects were concluded:

1. Density and viscosity of liquid metal eutectics (Al+Si, Pb+Bi, Pb+Sn).
   M.J. Assael, I.J. Armyra (Greece), W.A. Wakeham (UK), S.S.V. Stankus (Russia), J. Brillo, A. Thess (Germany), J.T. Wu (R.P. China), E. Kaschnitz (Austria), M. Banish (USA).
   Paper published in,
   J. Phys. Chem. Ref. Data, **41**: 033103 (2012)
   Paper published, project concluded.

3.2. PROJECTS CONTINUED

The following projects were discussed and it was agreed to continue them:

1. Reference correlations for the viscosity and thermal conductivity of fluids over extended temperature and pressure ranges.
   S.K. Mylona, E.K. Michailidou, M.J. Assael (Greece), M.L. Huber, R.A. Perkins (USA)

Prof. M. Assael informed that so far, through the excellent cooperation of his laboratory and NIST, the following reference correlations over extended temperature and pressure conditions, have been published in JPCRD

- Thermal conductivity: n-H_2, p-H_2, SF_6, toluene, benzene, n-hexane, n-heptane, methanol, ethanol (Cyclohexane and pentane on the way)
- Viscosity: n-hexane (n-heptane on the way)

Prof. V. Vesovic informed IATP that his group will be also producing reference correlations for

- Viscosity: Cyclohexane and n-hexadecane.

Prof. E. Vogel, finally informed IATP that his group will be also producing reference correlations for

- Viscosity: ethane, propane, and n- and i-butane.

These are recorded here so that readers will avoid unnecessary overlap of effort.

2. High-temperature, high-pressure viscosity standards.
   J.M.N.A. Fareleira - Coordinator, F. Caetano (Portugal), W. A. Wakeham, J.P.M. Trusler (UK), A.P. Froba, A. Leipertz, B. Rathke (Germany), K. Harris (Australia), A.R.H. Goodwin, A. Laesecke (USA), J. Fernandez (Spain), K. Schmidt (Canada), Chr. Boned (France)
   Prof. M. Assael informed everyone of the progress achieved so far by the group headed by Prof. J. Fernandez. Thus
   - At 0.1 MPA, a paper under the auspices of IATP has already been published, as: Comuñas M.J.P., Paredes X., Gaciño F., Fernández J., Bazile J.P., Boned C., Daridon J.L., Galliero D.G., Pauly J., Harris K., Assael M.J., and Mylona S.K., "*Reference Correlation of the Viscosity of Squalane from 273 to 373 K at 0.1 MPa*", J. Phys. Chem. Ref. Data 43:?:1-9 (2013). DOI: dx.doi.org/10.1063/1.4812573
   - At higher pressures, a new correlation is almost ready to be submitted.

   Dr. A. Goodwin informed IATP that an IUPAC proposal on "International standard for viscosity at temperatures up to 473 K and pressures below 200 MPa" (with Prof. JPM.Trusler, Prof. R.M. Enick, Prof. J. Fernandez, and Prof. M.J. Assael) has been approved and activities already started.

3. Three new volumes on experimental thermodynamics series will be published under the auspices of IUPAC.
   W.A. Wakeham - Coordinator, V. Vesovic (UK), A. Goodwin, M. Huber, J. Sengers (USA), M.J. Assael (Greece)
   Prof. Sir W.A. Wakeham informed everyone that
   - Vol. IX A is well on the way,
   - For Vol. IX B (Non-Equilibrium Thermodynamics), Prof, J.B. Sengers is expected to proceed with the final proposition of authors in the next few weeks, while
   - Vol. IX C (Industrial Applications), will start later on with Prof. V. Vesovic in charge.

4. Round Robin project on ionic liquids viscosity, and thermal conductivity measurements.
   J.M.N.A. Fareleira, C.A. Nieto de Castro (Portugal), A. Leipertz, A. Froeba, U. Hammerschmidt, B. Rathke (Germany), J. Fernandez (Spain), R. Perkins (USA), and K. Harris (Australia).
   Project continues and a round robin sample will soon be circulated. Results are expected in a year and only those who can guarantee to return results in this time should engage..
   - Prof. M.J. Assael informed participants that a European Union COST action on ionic liquids has been approved with Prof. A.-V. Mudring as Coordinator. In this action the 4th group is on thermophysical properties. In this group, IATP members (Prof. J. Fernandez, Group Coordinator, Prof. C.A. Nieto de Castro, Prof. M.J. Assael, Prof A. Padua). These members are to act as liaison between IATP and 4th Group, and ensure the proper measurement of the transport properties of ionic liquids.

5. Mexico research perspectives in the rheology of heavy oils.
   S.E. Quiñones-Cisneros (Mexico)
   Expect data on rheology of different crudes, combined effort of University of Mexico + Shlumberger
   - Prof. V. Vesovic informed the group about current progress. Project continues.

3.3. NEW PROJECT & OTHER MATTERS

No new projects were discussed. However, there was an interesting discussion on the following matters:

- It was felt that too many bad papers on Transport Properties are submitted for publication and a lot of them are rejected. This was especially true for some new publishers specialising in open access publication. The reviewing process was in danger of being abused because despite many negative comments papers were often accepted. There was general concern about the wasted effort involved and the fact the dangers to peer review's integrity and to the quality for work in the field was considerable. It was suggested that a more effective way to enhance the quality of papers might be to invite some of the authors to attend IATP, by approaching Conference Organizers (ECTP) and Editors
- The problem of using the inappropriate term "thermal conductivity" for heat transfer in systems of multiple phases systems (nanofluids etc, ionic fluid+particles), was also discussed. The failure to adhere to basic scientific principles was filling the literature with confusing ill-characterised work whatever the real prospect for such system to be of value in enhancing heat transfer. It was suggested that the Secretary should contact the organiser of the next ECTP conference to propose a workshop on this theme.

4. MEMBERSHIP

Prof. M.J. Assael reminded everyone that all information about IATP activities, as well as the current list of members, can always be found at

http://transp.cheng.auth.gr/ -> I.A.T.P.

It was also decided that members who had not attended for some time, and where there was evidence that they would not have a continuing connection, would be removed form the list.

No new members were put forward for approval.

5. FUTURE MEETINGS

5.1. 14th IATP Meeting, 2014

The 14th IATP Meeting will take place on Sunday Aust 31st in Porto, Portugal, in 2014, just prior to the 20th ECTP (August 31st –September 4th). Prof. Luis M.N.B.F. Santos (University of Porto) will be invited to be the local organiser and the Secretary will contact him.

6. LIST OF ATTENDEES

List of people that attended the meeting:

1) Prof. William A. Wakeham (UK), Chairman
2) Prof. Marc J. Assael (Greece), Secretary
3) Dr Eckard Bich (Germany)
4) Dr Anthony Goodwn (U.S.A.)
5) Dr Ulf Hammerschmidt (Germany)
6) Mr Andreas Heller (Germany)
7) Dr Robert Hellmann (Germany)

8) Mr Sebastian Herrmann (Germany)
9) Mr Benjamin Jager (Germany)
10) Ms Taa Kugler (Germany)
11) Dr Jurgen Millat (Germany)
12) Ms Sofia Mylona (Greece)
13) Prof. A. Nagashima (Japan)
14) Prof. Alfred Leipertz (Germany)
15) Mr Benedikt Over (Germany)
16) Prof. Nadejda Popovska-Leipertz (Germany)
17) Dr Bernd Rathke (Germany)
18) Dr Michael H. Rausch (Germany)
19) Dr Nicolas Riesco (U.K.)
20) Prof. W. Schroer (Germany)
21) Prof. Velisa Vesovic (U.K.)
22) Prof. Eckhard Vogel (Germany)
23) Prof. Stefan Will (Germany)