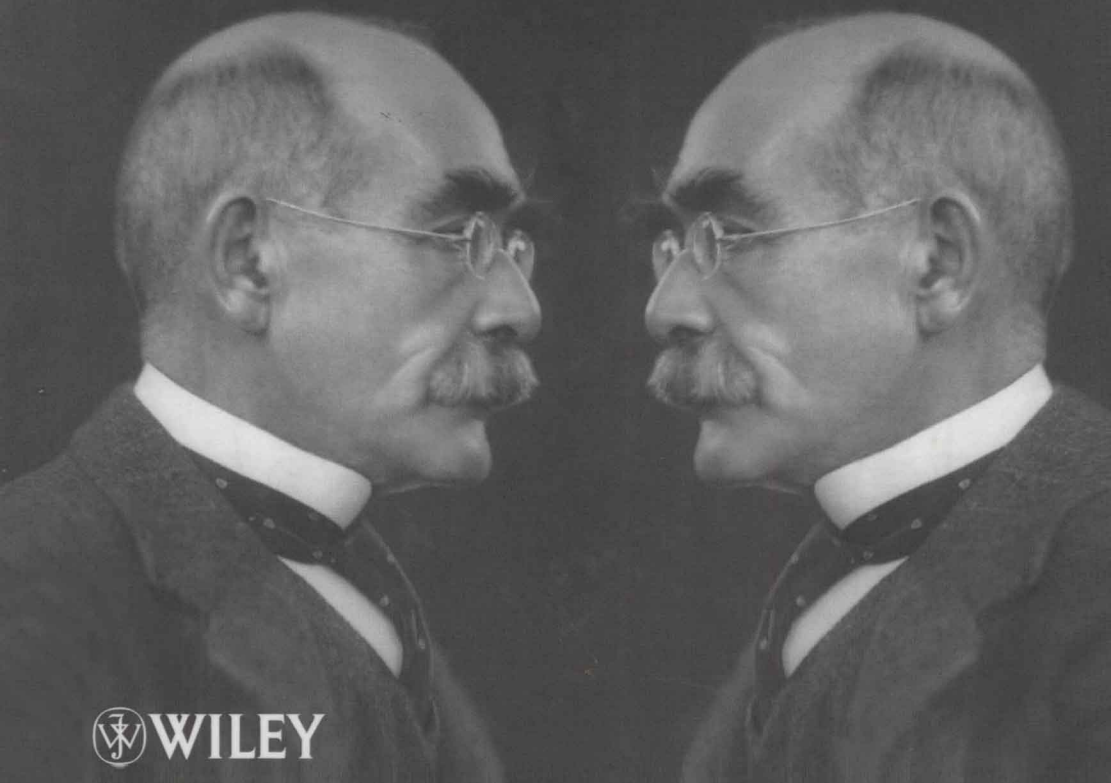

MOLTEN SALTS AND IONIC LIQUIDS

NEVER THE TWAIN?

Edited by
MARCELLE GAUNE-ESCARD
KENNETH R. SEDDON



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Never the Twain?

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PREFACE

Between Sunday 17th September 2006 and Friday 22nd September 2006, a meeting of major significance occurred in Hammamet, Tunisia: the 21st meeting of a series of EuChem Conferences on Molten Salts (for a comprehensive list, see preceding page). Not only did the 21st meeting have a metaphorical significance—a coming of age—but it marked a change in focus and title for the meetings. No longer the EuChem Conferences on Molten Salts, they were relaunched, phoenix-like, as the EuChem Conferences on Molten Salts and Ionic Liquids. This was a result of a long series of private conversations with many key figures, which culminated in an editorial (reproduced on the following pages) in *Molten Salts Bulletin* (2005, 85, 1–3). A gauntlet had been thrown down. To condense the arguments: Molten salts and ionic liquids are both liquid salts containing only ions—they are thus the same subject. All that is different is the temperature! Both fields involve the study of Coulombic fluids for academic and industrial purposes, both employ the same principles, both require skilled practitioners (but high temperature systems require greater skills), both speak the same language; all that is different is image, and how superficial is that? There is so much knowledge, both empirical and theoretical, which can be passed from the molten salt community to the ionic liquid community, and *vice versa*. The gauntlet was picked up, and the result was the Hammamet meeting, and this book. We believe this meeting has catalysed a *rapprochement* between the two communities: East has met West, the peaches have touched, the brooklets have mingled, and the Montagues and the Capulets are reunited. Both fields are now stronger for this, and the future meetings are assured to be the prime focus for renewing these exchanges.

Whilst representing some of the key talks at the meeting, this book also provides discussion on the transfer of experimental methods and techniques between the differing temperature régimes. While it is conventionally invidious to highlight specific chapters, the reviews from Austen Angell, Keith Johnson, Richard Pagni, and George Papatheodorou are remarkable for their depth of insight and breadth of pedagogic experience, while the chapter from Tsutomu Sada shows the way forward to the industrialisation of products based on this new technology. We believe this book will also act as a line in the sand—the contents are a snapshot of a strengthened field. The tears of the phoenix are said to contain the healing abilities of purity, and its cry is said to be a beautiful song. May it long continue to sing, and may we be aware enough to listen.

MARCELLE GAUNE-ESCARD

KENNETH R. SEDDON

EDITORIAL

NEVER THE TWAIN ?

Oh, East is East, and West is West, and never the twain shall meet,
Till Earth and Sky stand presently at God's great Judgment Seat;
But there is neither East nor West, Border, nor Breed, nor Birth;
When two strong men stand face to face,
tho' they come from the ends of the earth!

—Rudyard Kipling, *The Ballad of East and West* (1889)

Marcelle has asked me to write a personal editorial for *Molten Salts Bulletin*, and so I am taking her at her word. It will be personal, and hence it will be polemical. And I take as my subject the unfortunate, nay potentially disastrous, split which has emerged between the (high temperature) molten salt community (East) and the (low temperature) ionic liquid community (West). I will argue that this is destructive, cliquish, petty, and (if continuing) will result in the loss of key skills to the whole community. I do not want to wait until Judgement Day for the strong men (and women) of both camps to stand face to face!

I had the honour and privilege of being introduced to low-temperature molten salts, henceforth referred to as ionic liquids, by the fathers of the field—Chuck Hussey and John Wilkes. I was able to learn at the feet of the experts, in depth, the practical and theoretical aspects of ionic liquids, including much unpublished information. In other words, they taught me the tricks of the trade, with enthusiasm and generosity. It led to years of fruitful collaboration with Chuck, and my introduction into the molten salts community. This was dominated by the grandfathers of the field, Bob Osteryoung and Gleb Mamantov. Now, from my experience in the field of second-harmonic generation, whose practitioners were (by and large, but not universally) mean-minded, self-obsessed *prima donnas*, who treated newcomers as potential threats. I had steeled myself for a similar response from the molten salt community. Never had I been more wrong. I was immediately drawn to the core of the subject, and Bob and Gleb (intellectual giants) could not have been more welcoming to a tyro, and immensely generous with both their time and advice. And then there were the conferences: the Gordon Conferences, the Molten Salt Sessions at the Electrochemical Society meetings, the EUCHEM meetings, the Molten Salt series, and the Molten Salts Discussion Group (MSDG). And, as a zenith, the NATO ASI meeting in Camerino,

*From *Molten Salts Bulletin*, **85** 1–3 (2005).

two weeks in which all the key people in the field came together to teach the students and post-doctoral fellows. But it is now 2005, and I feel I could be writing an obituary for molten salts: the Gordon meetings were cancelled for lack of support, the Molten Salts meetings (the latest being MS7) will be lucky to have enough participants to be viable, the subject appears to be controlled by cliques, and the MSDG looks like a talking shop for the formerly active. And attending the lectures was intense *déjà vu*—lectures which contained little new content given by the same tired faces. And, most worrying, most of the highly skilled and imaginative practitioners (e.g., Øye, Angell, Freyland, Papatheodorou, Johnson, Gaune-Escard, Bjerrum, etc.) are approaching, or have passed, retirement age.

In contrast, the cheeky interloper, ionic liquids, which was lucky to get one session in ten in a molten salts meeting, which had very few practitioners, and which had no industrial track record, has gone from strength to strength. In June 2005, the first International Congress on Ionic Liquids (COIL) was held in Salzburg, with 410 participants; there have been three ten-session symposia at the ACS National meetings (San Diego, 2001; Boston, 2002; New York, 2003), each being the most attended sessions at their respective meeting; and a NATO ARW in Crete in 2000. The number of published papers on ionic liquids has risen from 20 in 1994 to over 1000 in 2004, and according to the independent ISI web site (<http://www.esi-topics.com/ionic-liquids/index.html>) there have been papers from 3342 authors in 57 countries, published in 290 journals, from 745 institutions. Tracking the open literature publications, patents in the area are also increasing exponentially, and industrial interest is burgeoning (BASF, DeGussa, Eastman Chemicals, and Iolitec already have commercial processes operating) and there are many large-scale suppliers (including Merck, Cytec, C-TRI, SACHEM, and BASF). Ionic liquids have captured the imaginations of the whole chemical (and, indeed, biochemical and physics) community, in a way that molten salts never did. But it is the same subject!! All that is different is the temperature! Both fields involve the study of Coulombic fluids for academic and industrial purposes; both employ the same principles; both require skilled practitioners (but high temperature systems require greater skills); both speak the same language (unlike the Americans and the British!!); all that is different is image, and how superficial is that?

So what has gone wrong – it is not clear when the twain stopped meeting, and why they are still separated. Maybe it is psychology, maybe personalities, maybe nomenclature. Marcelle—why is this the *Molten Salts Bulletin*, and not the *Ionic Liquids and Molten Salts Bulletin*? Why is MS7 not MS1L7? Why is MSDG not ILDG? It is not through lack of excellent and prominent people straddling the divide (viz. Johnson, Fehrmann, Boghosian, Angell, and Freyland (who gave a fascinating talk at COIL)). There is so much knowledge, both empirical and theoretical, which can be passed from the molten salt community to the ionic liquid community, and *vice versa*. WHY IS IT NOT HAPPENING? Any unbiased observer would note two immiscible groups, with a slightly fuzzy interface. I will lay my cards on the table—I want a homogeneous single phase. Am I a voice in the wilderness? I don't think so! I believe that the members of both communities for whom I have the greatest respect all feel the same way. Are we condemned to be Montagues and Capulets? Do we want to say

“Good night, good night! Parting is such sweet sorrow”? Is nomenclature going to keep us apart (***“What’s in a name? That which we call a rose by any other name would smell as sweet”***)? Do we accept that ***“What must be shall be”***? I would prefer to think that ***“Such young unfurrowed souls roll to meet each other like two velvet peaches that touch softly and are at rest; they mingle as easily as two brooklets that ask for nothing but to entwine themselves and ripple with ever-interlacing curves in the leafiest hiding-places.”*** (George Eliot, *Adam Bede*. 1859). So, I implore you all, reverse history, and enjoy the fruits of remingling. I suggest we seek funding from EUCHEM to bring about a joint meeting to map the way forward: Marcelle – that is one with your name on it!

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QUILL

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**Hoc erat in votis. Let us attempt to merge East and West together Ken.
And let it be in 2006.**

MARCELLE

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