50 Years in Surface Chemistry

SURFACE CHEMISTRY AND CATALYSIS

EDITED BY A. F. CARLEY, P. R. DAVIES, G. J. HUTCHINGS AND M. S. SPENCER, Kluwer Academic/Plenum Publishers, New York, 2002, 400 pages, ISBN 0-306-47393-3, £100.50, €157.50, U.S.$150

"Ideas do not drive science. Instead, new instruments and techniques are critical to the discovery process, by which progress is measured". That is the view of Professor Sir John Meurig Thomas, which he puts forward at the outset of the book entitled "Surface Chemistry and Catalysis". This book has been published to mark the 70th birthday, in 2001, of Professor M. Wyn Roberts and his fifty continuous years working in the area of surface science. Professor Roberts was appointed to the first Chair of Physical Chemistry at the University of Bradford in 1965, then in 1979 to the Chair of Physical Chemistry at the University of Cardiff. He was awarded the Tilden Medal and Lectureship in 1976, The Royal Society of Chemistry Award in Surface Chemistry in 1987, and the John Yarwood Memorial Medal and Prize of the British Vacuum Council in 1999.

The book is divided into three sections: Surface Science, Model Catalysts, and Catalysis, topics in which he has always been interested. The authors for each chapter were selected from the many eminent scientists who have worked with Professor Roberts in various ways and all are well acknowledged. They are a world-class cast to provide persuasive support for Sir John's point – until Wolfgang Sachtler and an equally impressive team of catalyst scientists draw the reader towards the conclusion that, at least in catalysis, there is a 'virtuous cycle' linking inspired concepts (hypotheses and inventions) with the useful technology that often defines progress.

Appropriately for a tribute book, each chapter is of a consistently high standard. So, are there highlights? I particularly like the way in which D. C. Meier, X. Lai and D. W. Goodman do not try to skirt around the unavoidable issue of the reality gap between model and real surfaces, nor do they back away from trying to explain the complex electronic relationship between metal particles and a support material. Later, in a very topical chapter on gold catalysis, G. U. Kulkarni, C. P. Vinod and C. N. R. Rao capture the essence of an almost unique area of science, indeed, one in which everyone agrees (or perhaps no-one dares to disagree) that in the case of gold, particles of size 2–4 nm are essential to achieve high catalytic activity.

Then, Jerzy Haber describes the 'living' surfaces of metal oxides, putting a modern twist on the role that reducible oxides play in redox catalysis. This chapter made me think of the classic work of Vol'kenshtein (1), in which he tried to correlate the catalytic activity of metal oxides with their bulk semiconducting properties and which has undoubtedly influenced many catalyst scientists. This work is now rarely cited, except in the field of chemical sensors.

Besides reading like a "Who's Who" of catalysis and surface science, this book covers many of the major categories of surface-active materials. The platinum group metals, favoured for their single crystals as well as for their role in supported catalysts, appear regularly throughout. Two chapters are completely dedicated to the surface activity of gold – currently one of the most active fields of research. Although slightly overshadowed by the precious metals, base metals feature in substantial sections on metal-catalysed hydrogenation, metal oxides, and solid-acid catalysis. Zeolites come off worst in terms of column inches. The chapter by Graham Hutchings redresses the balance, however, by making the point that zeolites and related materials are some of the most useful building blocks in catalyst design. The big theories (such as transition state theory (TST) and strong metal support interaction (SMSI)) are well represented, although most of them are now largely taken for granted.

The editors openly admit that the only obvious failing of this book is that it does not look to the future, even though the authors were asked to do so. However, as a current and retrospective view of catalysis it achieves a fitting tribute to Wyn Roberts – it makes you think about, and analyse, the route we have taken in catalysis and surface chemistry. Any 'crystal ball' gazing would have made the book seem very dated in a few years' time. As for the question of how progress is made – Professor Roberts has already provided us with a few accomplished answers to that during his 50 years' work (2)!

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References

1 T. Vol'kenshtein, "The Electronic Theory of Catalysis on Semiconductors", Pergamon Press, Oxford, 1963

2 M. W. Roberts, 'Heterogeneous Catalysis Since Berzelius: some personal reflections', *Catal. Lett.*, 2000, 67, (1)

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Johnson Matthey Catalysts Division

In November 2002, Johnson Matthey completed the acquisition from ICI of its Synetix business. Synetix was added to Johnson Matthey's Catalysts & Chemicals Division, which was then renamed Johnson Matthey Catalysts. This division comprises Process Catalysts and Technologies (PCT), Environmental Catalysts and Technologies (ECT) and Fuel Cells. The former Synetix businesses, now part of PCT, bring a complementary range of base metal technologies to Johnson Matthey's traditional precious metals catalysis business.

Synetix was formed in 1998 from three ICI businesses: Katalco, Vertec (adhesion promoters) and Tracerco, and from businesses from Unilever: Unichema catalysts and the HTC catalysts business from Crosfield. It also included the former BASF syngas catalysts, linked to the ammonia and methanol markets.

Subsequently, units such as J & J Dyson's 'Dycat' business related to the hydrogen industry and to refineries and the oil and gas areas, and the former catalyst units of Celanese: 'Hoecat' for edible oils and 'CelActiv' linked to the alcohol sector, were acquired. In India, the catalyst business of Hindustan Lever – linked with oleochemicals and the Taloja facility for catalysts for oleochemicals and edible oils, were also acquired.

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