Greenhouse Gases—Mitigation and Utilization

Many governments struggle with the greenhouse gas (GHG) problem, trying to balance this long-term imperative with shorter-term economic needs, which are often more pronounced in developing nations. Industries seek ways to reduce their emissions, but are constrained by the lack of practical technology and clear government direction. The scientific community is making the GHG problem a major area of study. A conference has been planned that will bring all three of these groups together, to seek a broad mutual understanding of the current situation and clarity for future directions.

CHEMRAWN (Chemical Research Applied to World Needs) and the International Conferences on Carbon Dioxide Utilization will hold a combined conference that will cover the science and policy related to mitigation and utilization of CO_2 and other greenhouse gases. In addition, the conference aims to provide a broad mutual understanding of the current situation and clarity for future directions.

The meeting is being held six months before the Kyoto-protocol commitment period begins. Signatory governments are committed to meeting their targets within the 2008–2012 time period. However, many questions remain over how will this be achieved.

Scientists, engineers, and industrial or governmental policymakers are invited to participate in this conference, which will cover the following topics:

- the carbon balance in nature
- mitigation strategies
- government policy
- improved combustion processes
- capture of CO_2
- CO_2 sequestration
  - in terrestrial reservoirs
  - in deep seas
  - in soil and biomass
  - by carbonate formation
- mitigation of N_2O and methane
- utilization of CO_2
  - enhanced oil or gas recovery
  - methane recovery from hydrates
  - enhanced agricultural production
  - as a solvent or in CO_2-expanded liquids
- CO_2 as a feedstock
  - biochemical conversion
  - homogeneous catalysis
  - heterogeneous catalysis
  - photochemical or electrochemical conversion

The conference, organized jointly with the 9th International Conference on Carbon Dioxide Utilization, will be held **8–12 July 2007** at Queen's University in Kingston, Ontario, Canada. Information on the conference is available at <www.chem.queensu.ca/greenhouse>.

For more details, contact the Task Group Chairman Gary van Loon <vanloon@chem.queensu.ca>.

www.iupac.org/projects/2006/2006-031-1-021.html

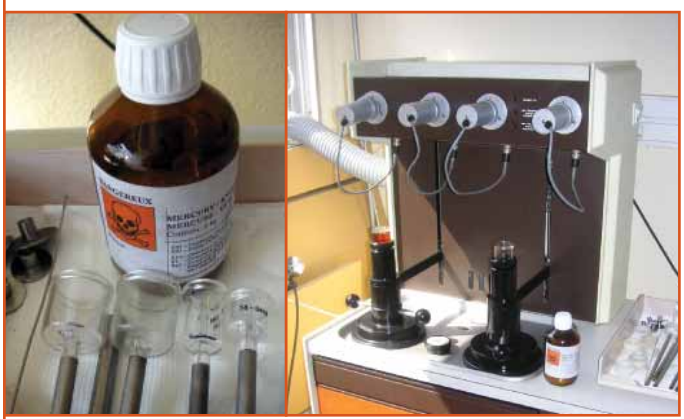
Liquid Intrusion and Alternative Methods for the Characterization of Macroporous Solids

Scientists working on porous materials, like adsorbents or catalysts (carbons, clays, silicas, aluminas, zeolite), first paid attention to their *micro*pores (pore width smaller than 2 nm) and *meso*pores (width between 2 and 50 nm) since these are responsible for the high-surface area and enhanced surface properties of these materials. More recently, research focused on the optimization of these adsorbents (e.g, to produce oxygen or hydrogen or to recover solvents) or catalysts (like exhaust catalysts) has demonstrated the importance of hierarchical porous structures, including *macro*pores (wider than 50nm), in speeding gas transport.

Currently, the most efficient method to characterize macropores in a broad size range is mercury-intrusion porosimetry. However, the everyday handling of mercury that is required raises serious health and environmental problems. Among the problems involved are inevitable spills and the need to recycle the mercury polluted by the sample. Hence, the objectives of this project are as follows:

1. To examine alternative *liquid intrusion* techniques (and others if possible) available to assess the

pore-size of materials, with special attention to macropores.
2. To establish a *critical and comparative* appraisal.
3. To assess the various procedures requiring mercury handling and recommend the safest practice.
4. To publish the findings as an IUPAC Technical Report so it may be broadly disseminated in the corresponding scientific and technical communities. This will be accomplished with help from the equipment manufacturers who will be associated with the project.



Intruding mercury up to 400 MPa allows for the determination of pore width, from 3 nm to 100 μm, in rigid porous materials. The glass intrusion chamber (four different sample sizes are shown here) is to be filled with the sample and then with mercury before being inserted in the high pressure unit (here accommodating two chambers). After each experiment, the mercury spoiled with powder and oil (used to exert the pressure) needs to be cleaned and distilled.

The aim of this project is to provide a first step toward satisfactory answers, by listing, examining, and evaluating all trials conducted in the field. It will consider the intrusion of safer liquids (other molten metals, water, organics) and also the extension of the analysis of capillary condensation data up to the macropore range, which until recently was considered inapplicable. The need for improvements and/or alternative methods is urgent. By clarifying the situation, this project should help in the selection and development of more promising approaches. The issue concerns most scientists and industrialists working with porous materials, including catalysts, pharmaceuticals, building materials, stones of ancient monuments to be restored or protected, adsorbents for chromatography, and liquid purification or gas separation.

For more information contact Task Group Chairman Jean Rouquerol <jean.rouquerol@up.univ-mrs.fr>.

www.iupac.org/projects/2006/2006-021-2-100.html

Priority Claims for the Discovery of Elements with Atomic Number Greater than 111

by John Corish

Despite the fact that there are now 111 elements in the Periodic Table, the discovery and naming of a new member of this exclusive group is still seen as one of the most exciting events in the world of chemistry and indeed of science. The making of a new element requires very large and expensive facilities as well as expertise that now often involves international collaborative efforts. The two most recently named elements were made first at Gesellschaft für Schwerionenforschung (GSI) in Darmstadt, Germany. The additions of darmstadtium (110) and roentgenium (111) to the Periodic Table were formally approved by IUPAC in 2003 and 2004, respectively.

The process leading to the naming of a new element is the responsibility of the Inorganic Chemistry Division of IUPAC and is two fold. First, claims for its discovery are thoroughly examined by a Joint Working Party of experts appointed by the presidents of IUPAC and the International Union of Pure and Applied Physics (IUPAP). These experts examine claims submitted by laboratories to determine whether they fully meet the carefully laid-down criteria for the discovery of a new element [*Pure Appl. Chem.* 63(6), 879–886, 1991]. If the working party is satisfied that the criteria are met, then priority for discovery is assigned to the laboratory that submitted the claims. The second part of the process, in which the successful laboratory is invited to propose a name for the element, can then begin. New names are expected to fall within established guidelines [*Pure Appl. Chem.* 74(5), 787–791 (2002)] and are carefully examined by IUPAC experts and published for a period for public review, before

they are finally brought to the IUPAC Council for final approval. The sequence of events is set out in the diagram on the right.

An "Island of Stability" is predicted for elements with Atomic Numbers close to 118, and in recent years, many laboratories around the world have been actively trying to make elements approaching that number. As recently as October 2006, new reports of the making of element number 118 were widely published in the public press. (e.g., "Element 118, Heaviest Ever, Reported for 1,000th of a Second" *New York Times* 17 Oct. 2006, by James Glanz; "Element 118 Detected, With Confidence" *C&EN*, 17 Oct. 2006, by Mitch Jacoby)

So, are there new kids on the block? To answer this question, an IUPAC/IUPAP Joint Working Party, chaired by Paul Karol, is currently considering claims for the discovery of elements numbered 112, 113, 114, 115, 116, and 118, and is expected to report on these claims during the coming year. For more details, see project #2006-046-1-200.

www.iupac.org/projects/2006/2006-046-1-200.html

New Element?

- Analysis of the claim by IUPAC/IUPAP
- Publication of the analysis in *Pure and Applied Chemistry*
- Invitation of the credited group to propose a name
- Provisional recommendation presenting the proposed name
- Public review
- Final approval by the IUPAC Council
- Publication of the approved name in *Pure and Applied Chemistry*

Another IUPAC Initiative Relevant to the CWC

Impact of Advances in Science and Technology on the CWC

The objective of a recently initiated IUPAC project is to prepare an assessment of the impact of developments in science and technology on the operation of the Chemical Weapons Convention (CWC) as a contribution to the Second Review Conference of the CWC to be held in spring 2008. IUPAC is in a unique position to tap into a broad spectrum of scientific expertise through its divisions and constituent national chemical societies and science academies. Based on the Bergen experience [project #2001-057-1-020], the project will provide valuable input for the review process of the Member States of the Organisation for the Prohibition of Chemical Weapons.

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www.iupac.org/projects/2006/2006-036-1-020.html