



Protocol in the lab

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At their most recent meeting, Parties to the Montreal Protocol (including Australia) agreed to start looking more closely to find ways to further reduce all uses of ozone-depleting substances, especially carbon tetrachloride. Countries have been urged to join the effort to phase out its use in the laboratory.

Image credit: iStockphoto

The Montreal Protocol on Substances that Deplete the Ozone Layer* was finalised in 1987 and came into force in 1989. It set in place a long-term program to phase out the use of ozone-depleting substances in order to help restore the ozone layer. Australia ratified the Montreal Protocol in May 1989 and, given the national interest in improving the state of the ozone layer, it has been an active participant in Montreal Protocol matters ever since.

The protocol put controls in place to phase out the production and consumption of key ozone-depleting substances including chlorofluorocarbons, halons, carbon tetrachloride, methyl chloroform, bromochloromethane, methyl bromide and hydrochlorofluorocarbons. For developed countries, most of these substances were to be phased out by 1996, except for approved essential uses. For developing countries, the phase-out date was 1 January 2010.

Revisiting exemptions for laboratory and analytical uses

It was recognised that it would be difficult to phase out ozone-depleting substances for some uses. At their sixth meeting in 1994, Parties to the Montreal Protocol agreed that certain high-purity ozone-depleting substances would be exempted from the phase-out process due to their specialised laboratory and analytical uses.† These exempted uses have been reduced over the years.

The conditions applied to determine whether the substances were being used for laboratory and analytical purposes included:

- specific uses (e.g. extraction solvents, diluents, carriers, inert solvents)
- a high level of purity (99.0 or 99.5%)
- packaging of the substances
- annual reporting.

At its seventh meeting in 1995, Parties adopted an



Polar stratospheric clouds (nacreous clouds) at Davis Station after sunset on 1 September 2008. Nacreous clouds contribute to Antarctic ozone depletion by providing surfaces upon which heterogeneous chemical reactions take place. These reactions lead to the production of free radicals of chlorine in the stratosphere which directly destroy ozone molecules. Image credit: Greg Stone, AAD.

illustrative list of laboratory and analytical uses, which has been subsequently updated. The current list of exempted laboratory and analytical uses was revised in November 2009. More detailed information on particular laboratory and analytical uses can be found in Chapter 7.4 of the May 2009 progress report of the Technology and Economic Assessment Panel at <http://ozone.unep.org/Assessment_Panels/TEAP/Reports/TEAP_Reports/Teap_progress_report_May_2009.pdf>.

The exemption for laboratory and analytical uses is now in place until 2014. The November 2009 meeting agreed to extend the exemption for developed countries (like Australia) until 2014, and to make the exemption available to developing countries as well, due to commencement of the 100% phase-out of ozone-depleting substances for them on 1 January 2010. Developing countries have also been given some leeway in meeting the reporting requirements,

given that they have not had to report laboratory and analytical uses to date.

It is the intention of Parties to the Protocol to look more closely at exempted laboratory and analytical uses with a view to reducing them to a minimum, or phasing them out altogether. In 2009, the technical panel reported on those uses for which alternatives exist and which are no longer necessary. The technical report (*Report of the Technology and Economic Assessment Panel*, May 2009, Chapter 7) indicated that all but two uses had alternatives available. It noted that nearly all the laboratory and analytical exemptions related to uses of carbon tetrachloride, and that in many cases alternatives can be employed to obtain the same result.

The report was considered by Parties at their meeting in July 2009 and afterwards in the lead-up to their main meeting in November. They noted that many of the laboratory and analytical uses were stan-

dards or methods set by the United States Pharmacopoeia, United States EPA, ASTM International or other standard-setting bodies. The ASTM International and other standard-setting bodies also set some alternative methods and standards; however, some alternative methods or procedures highlighted by the technical body had only been described in journal articles, or had been determined on the basis of personal experience. In addition, there was no information provided about the validation or certification of the new standard/method against the existing standard/method.

As a result, Parties agreed on a way forward that identifies a number of actions for countries and for the Ozone Secretariat, the Secretariat of the Montreal Protocol. The decision extends the laboratory and analytical exemption until 2014, but in the meantime it requests:

- countries to urge their national standards-setting organisations to identify and review those standards that mandate the use of ozone-depleting substances in laboratory and analytical procedures. This action is sought with a view to asking those organisations to adopt, where possible, laboratory

tifying alternatives, relevant standards and technical/economic barriers to the uptake of alternatives in laboratory and analytical uses and to report back to Parties this year.

Australian Professor Ian Rae is heavily involved in the technical body, advising on laboratory and analytical uses, and he is co-chair of the Montreal Protocol's Chemical Technical Options Committee. He has been instrumental in guiding countries on the technical aspects related to laboratory and analytical uses and will be leading the global information-gathering exercise requested by Parties this year.

The Australian situation

Ozone-depleting substances are not manufactured in Australia and can only be imported into Australia under licence, issued by the Department of the Environment, Water, Heritage and the Arts (DEWHA). Importing ozone-depleting substances for laboratory and analytical uses into Australia requires the approval of an essential use licence (in accordance with the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*). The cost of an application for an essential use licence is \$3000.

The technical report indicated that all but two uses had alternatives available.

- and analytical products and processes that are free of ozone-depleting substances
- countries to continue investigating domestically the possibility of replacing ozone-depleting substances in laboratory and analytical uses and to make this information publicly available via the Ozone Secretariat
- the Ozone Secretariat to enter into discussion with the International Standards Organisation, ASTM International and other international standardisation organisations to encourage them to identify any existing methods still using ozone-depleting substances and to expedite the inclusion of alternative methods, techniques and substances in their standard methods
- the technical body to continue its work on iden-

At present, no organisation or business in Australia has an essential use licence to import carbon tetrachloride or other ozone-depleting substances for laboratory uses. One university had an essential use licence issued in 2008 for the purpose of importing carbon tetrachloride into Australia for laboratory and analytical purposes, but this licence expired on 31 December 2009.

Chemists at RMIT University, in an article in the *Journal of Chemical Education*, have recommended the replacement of carbon tetrachloride by petroleum spirit in an undergraduate experiment (iodochlorination of styrene) for health reasons. With permission from the authors, Professor Rae published a note in the same journal, drawing the attention of readers to the Montreal Protocol reasons for not using carbon

tetrachloride.

Professor Rae has been consulting with research institutions, and believes there are old carbon tetrachloride stocks being used, which is currently allowed under the Montreal Protocol and Australian national legislation. Professor Rae has indicated that there may

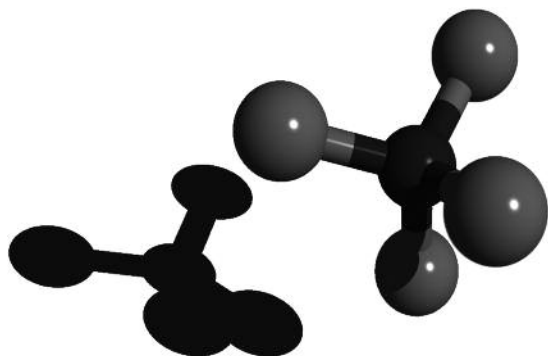
What you can do

The Montreal Protocol is reaching the last stages of its phase-out of ozone-depleting substances, and pressure is being applied to countries to reduce all uses of ozone-depleting substances. The laboratory and analytical exemption in its current form is unlikely to

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still be some uses where carbon tetrachloride in particular is hard to replace and he is keen that Australian research institutions work together to identify alternative uses where possible, given that these alternative methods and practices will have international applications. This is consistent with the decision by Parties last year to continue to investigate alternative uses of ozone-depleting substances in laboratory and analytical uses and to distribute the information.

In response to the decision by Parties last year, DEWHA will also be working closely with Australian standard-setting organisations to determine if any of them still mandate the use of ozone-depleting substances in their standards, and if they do, work to try to remove them where feasible.



be in place past 2014 – for developed countries at least.

If you are still using ozone-depleting substances (specifically carbon tetrachloride, but maybe others) in your laboratory, now is the time to start thinking about using alternatives, either established or by designing new processes.

If you are successfully using alternatives in your laboratory that are not mandated by an international standard-setting body, consider making petitions to the international standard-setting body about mandating this alternative use and/or contacting DEWHA <ozone@environment.gov.au> or Professor Rae <iandrae@bigpond.com> so the information can be made available internationally.

If you know of an Australian or international standard that still mandates the use of an ozone-depleting substance, contact DEWHA so it can be followed up at the national and international level.

*The Montreal Protocol on Substances that Deplete the Ozone Layer is subsidiary to the Vienna Convention on Protection of the Ozone Layer. Protocols like this are used to codify particular actions supporting the aims of the main agreements.

†Reports of Meetings of the parties are accessible on the ozone website <http://ozone.unep.org/Meeting_Documents/mop/index.shtml>. The *ozone handbook*, also available on the Ozone Secretariat website, sets out the text of the Convention and the Protocol, lists the controlled substances, and gives decisions and phase-out dates.

This article was contributed by Ms Gabriel from the Ozone and Synthetic Gas Team from the Department of the Environment, Water, Heritage and the Arts, Canberra.