C_3 News

Spring 1993
Vol. 18, No. 1

Newsletter of College Chemistry Canada / La Chimie Collégiale au Canada

Joint Conference Takes Shape

This issue of *C_3 News* contains the information you need to attend and participate in the joint C_3–$2YC_3$ conference at the Community College of Rhode Island on June 3rd through the 5th. Registration procedures, travel and accommodation information, a call for papers and the preliminary program is given in the pull-out centre section.

For those of us unfamiliar with the northeastern United States, this will be an opportunity to meet our fellow chemical educators, to discover the city of Providence, and, if time permits, to explore the sights of Boston, Cape Cod, New England and maybe even New York.

One aspect of our conferences which is essential, but often poorly attended, is the annual general meeting. If you feel like getting involved in C_3 activities, there is plenty of room for new blood and fresh ideas. The organisation is in strong financial shape, and has conferences planned for the next few years in various parts of Canada. As always, we look forward to this year's and other joint conferences with $2YC_3$ — together we have been able to substantially broaden the discussion of our common passion and cause — chemical education. See you in Rhode Island!

Old Slater Mill, birthplace of the textile industry in the United States. Built at Pawtucket by Samuel Slater in 1793, it became the country's first successful cotton mill.

Photo: Eric M. Sanford

In this issue:

NOTICE OF BUSINESS MEETINGS

College Chemistry Canada, Inc.

Location: Community College of Rhode Island,
400 East Avenue,
Warwick, Rhode Island

Joint C_3 Executive and Board Meeting

Thursday, June 3, 1993, at 2:00 pm

Annual General Meeting

Friday, June 4, 1993, at 5:00 p.m.

CALL FOR NOMINATIONS

College Chemistry Canada, Inc.

Nominations are invited for the following positions on the College Chemistry Canada Executive:

President Elect
Editor
Treasurer
Regional Directors: two each from the following five regions —

B.C. and Yukon
Saskatchewan, Manitoba, Alberta, NWT
Ontario
Québec
Atlantic Provinces

Please send nominations to the Secretary of College Chemistry Canada:

Dr. Robert Perkins
Kwantlen College
P.O. Box 9030
Surrey, B. C.
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Nominations will also be received at the Annual General Meeting on June 4, 1993 at the Community College of Rhode Island.

43rd Canadian Chemical Engineering Conference

Sponsored by the Canadian Society for ChemicalEngineering, will be held at the Citadel Inn, **October 3–6, 1993,** in Ottawa, Ontario.

For general information about the conference, contact Diane Goltz, Program Manager, Canadian Society for Chemical Engineering, 130 Slater Street, Suite 550, Ottawa, Ontario, K1P 6E2, CANADA.

Tel: 613-232-6252
Fax: 613-232-5862
E-MAIL: CSCXT@UOTTAWA

76th Canadian Society for Chemistry Conference and Exhibition

Sponsored by the Canadian Society for Chemistry, will be held at the Delta Convention Centre, **May 30–June 3, 1993,** in Sherbrooke, Québec.

For general information about the conference, contact Diane Goltz, Program Manager, Canadian Society for Chemistry, 130 Slater Street, Suite 550, Ottawa, Ontario, K1P 6E2, CANADA.

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Correction

In the excellent survey of textbook energy profiles (*C_3 News*, Vol. 17, #4), the captions for figures 1 and 2 were inadvertently interchanged. The editor apologizes for any lost sleep amongst those readers whose basic beliefs were questioned by this error. Also, Table 3 listed "non-specialist" texts.

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Articles of any length will be gladly accepted. Please send typewritten copy to the Editor at the above address or send by fax. Copy can also be sent on a $3^1/_2$" disk, MAC format using Microsoft Word, or any wordprocessor producing ASCII output.

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CAFFEINE EXTRACTION FROM TEA — A SIMPLIFIED PROCEDURE.

Edward G. Neeland
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The isolation of caffeine from tea is a popular second-year organic experiment and we have been following standard laboratory procedures1 which commence by boiling the tea bags in an aqueous basic solution for 10–20 minutes, followed by filtrations, CH_2Cl_2 extraction and eventual sublimation to yield pure caffeine. However, students encountered a number of difficulties with this procedure. Namely:

i) The cooled basic solution containing caffeine and precipitated tannin salts was viscous and the recommended suction filtration was tediously slow due to clogged filter papers.

ii) Even with a minimum of agitation, the CH_2Cl_2 extraction of the black filtrate gave rise to stubborn emulsions. In fact, the care required to avoid emulsions left much of the desired caffeine in the aqueous layer.

iii) The vacuum sublimation of crude caffeine results in too much product being lost through the side arm of the filter flask and vacuum tubing.

In addressing the students' concerns, we have found that the following changes significantly simplified the lab procedure without sacrificing yield or purity of the final product.

We suspected that boiling the tea bags in aqueous base for 10–20 minutes was unnecessary. Instead, the tea bags were swirled in only hot distilled water for one minute. The resulting amber-coloured solution required no filtration and no further concentration by boiling. Separatory extraction of this solution with CH_2Cl_2 was notable due to the absence of the normally encountered intractable emulsions1 (presumably due to a lower concentration of tannins). A subsequent vigorous washing of the combined CH_2Cl_2 layers with NaOH removed any tannins without complication.

A final, but important, change involved the sublimation of the crude caffeine at atmospheric pressure rather than under a vacuum in order to eliminate undue losses of product to the aspirator hose.

Conclusion

The isolation of caffeine from tea was simplified by extracting the tea bags in hot water (not boiling aqueous base) for 1 minute (not 10–20 minutes) and eliminating all filtrations. Furthermore, for maximum recovery, the sublimation of the crude product was carried out at atmospheric pressure (not under a vacuum). The convenience gained with these changes was considerable and, in our hands, actually increased the yield of caffeine isolated over standard extraction practices. As an added benefit, this procedure required much less time to complete the experiment.

Experimental

To 100 mL of distilled water at 97–99°C was added three tea bags and the contents were swirled for 1 minute. The tea bags were then placed between two watch glasses and the excess tea was squeezed back into the solution. The tea bags were discarded and the tea solution was cooled to room temperature using an ice-water bath.

The cooled tea solution was poured into a separatory funnel and gently shaken with three separate 20 mL washings of dichloromethane. Any emulsions were broken up by agitation with a glass rod and waiting for 2–4 minutes. The three CH_2Cl_2 extractions were combined and washed twice with 20mL of cold 6M NaOH and once with 20 mL of cold distilled water. The CH_2Cl_2 layer was dried over sodium sulfate, decanted into a beaker and, in a fumehood, evaporated to about 3mL on a hot plate. Using a Pasteur pipette and a minimum of CH_2Cl_2, the crude caffeine was transferred to a 125 mL filter flask and the solvent completely evaporated on a hot plate until only off-white crystals remained.

An ice-filled test tube equipped with a rubber adapter was attached to the above 125 mL filter flask so that the test tube bottom rested about 1 cm above the bottom of the filter flask. The filter flask was placed on a preheated hot-plate and the sublimation was continued until a 1 cm clear ring had formed on the sides of the filter flask. The pure product was isolated as colourless crystals (45 mg., M.P. = 229–232°C, Lt. M.P. 235–237°C).

References

(a) Nimitz, Jonathan S. *Experiments in Organic Chemistry*; Prentice Hall: New Jersey, 1991; p. 61.

(b) Eaton, David C. *Laboratory Investigations in Organic Chemistry*, McGraw-Hill: New York, 1989; p. 343.

(c) Pavia, Donald L.; Lampman, Gary M. and Kriz, George S. *Organic Lab Techniques*; 3rd ed.; Saunders: New York, 1988; p. 62.

(d) Hart, H., *Lab Manual, Organic Chemistry*; 7th Ed., Houghton Mifflin Co.: Boston, 1987; p. 48.

(e) Mayo, Dana W.; Pike, Ronald M. and Butcher, Samuel S. *Microscale Organic Laboratory*; Wiley: New York, 1986; p. 123.

HOT FROM THE PRESSES

The free radical gas nitrogen oxide is the subject of an article detailing with neurotransmitters in the body. NO is known to be necessary for a wide range of neural responses. *Science, 257,* pp. 494–496, July 24, 1992.

Supercritical carbon dioxide may be able to replace the use of CFC's as a solvent for the formation of fluoropolymers. *Science 257,* p. 945, August 12, 1992.

The smallest battery yet constructed (70 nanometres across) can produce 0.0200 volts for 45 minutes. This corresponds to the reaction of approximately 80,000 Cu atoms. *Science, 257,* p. 1207, August 28, 1992.

A ranking of the possible carcinogenic hazards of a variety of natural and synthetic chemicals is presented in an interesting article by Ames et al. Some food for thought here. *Science, 258,* pp. 261–265, October 9, 1992.

—*Bob Perkins*

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