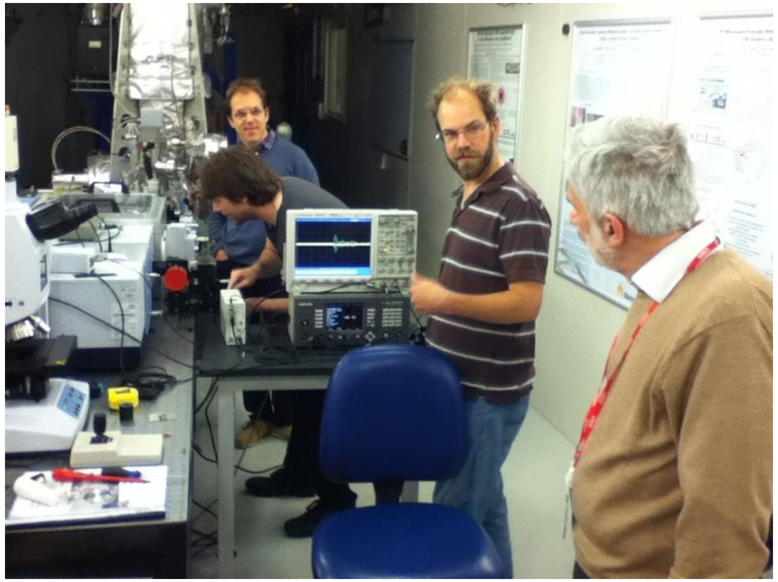
Some memories of everybody’s friend and colleague, Dr. Kirk Michaelian,
an original IR Beamteam member and lead for the Mid IR for a number of years.
Tim



The experimental collaborative trip with NRCan, CLS and the Diamond Light Source -we had arranged to meet in Hartwell, England, in July 2016, to explore a new micro–PAS cell design.

Kirk with Gianfelice Cinque, the beam line scientist at Diamond; also with Mark Frogley.

The research crew preparing for the experiment; Luca Quaroni, now in Poland on the left, Kirk ,and me on the right (when I had a mustache),

Luca was the 1st Mid IR beamline scientist at CLS.

Kirk was interested in making measurements on ever smaller samples, and got the idea about
The SRIR advantage for micro IR experiments very early in the game – before CLS had walls up!

REVIEW OF SCIENTIFIC INSTRUMENTS VOLUME 72, NUMBER 12 DECEMBER 2001

Synchrotron infrared photoacoustic spectroscopy

Kirk H. Michaelian[a)]
Natural Resources Canada, CANMET Western Research Centre, 1 Oil Patch Drive, Devon, Alberta T9G 1A8, Canada

Richard S. Jackson
Bruker Optics Inc., 19 Fortune Drive, Billerica, Massachusetts 01821

Christopher C. Homes
Department of Physics, Brookhaven National Laboratory, P.O. Box 5000, Upton, New York 11973-5000

(Received 19 June 2001; accepted for publication 31 August 2001)

The use of synchrotron radiation (SR) as a far- and mid-infrared source in the measurement of photoacoustic Fourier transform infrared spectra of solids is demonstrated for the first time in this work. Initial experiments were performed at beamline U10A at the National Synchrotron Light Source, Brookhaven National Laboratory. For synchrotron photoacoustic spectroscopy to be feasible, it must yield results superior to those obtained with a conventional thermal (Globar®) source; accordingly, SR and Globar® photoacoustic spectra recorded under similar conditions were compared in detail. The intensities of SR far-infrared photoacoustic spectra were found to be consistently greater than the corresponding Globar® spectra. At shorter wavelengths, SR always underfills the effective aperture (or, alternately, sample size); SR is a superior source in a spectral region that is a function of this aperture. The high wave number limit of this region exhibits a power-law dependence on aperture size. This investigation also showed that the entire mid-infrared photoacoustic spectrum is more intense using SR and apertures smaller than approximately 0.5 mm.
 [DOI: 10.1063/1.1416107]

ELSEVIER

Infrared Physics & Technology

journal homepage: www.elsevier.com/locate/infrared

Transmission and photoacoustic spectroscopy of organosulphur and aromatic hydrocarbons using coherent synchrotron radiation

Kirk H. Michaelian[a,*], Brant E. Billinghurst[b], Tim E. May[b], Ward A. Wurtz[b], Cameron Baribeau[b]

[a] *Natural Resources Canada, CanmetENERGY in Devon, One Oil Patch Drive, Devon, Alberta T9G 1A8, Canada*
[b] *Canadian Light Source Inc., 44 Innovation Boulevard, Saskatoon, Saskatchewan S7N 2V3, Canada*

ARTICLE INFO

This work is dedicated to the memory of Dr. J.C. Bergstrom.

Keywords:
Coherent synchrotron radiation
THz spectroscopy
Hydrocarbons

ABSTRACT

This article describes transmission and photoacoustic spectroscopy experiments performed using coherent synchrotron radiation (CSR) at the Canadian Light Source. The storage ring was operated at energies of 1.0 and 1.5 GeV, with currents between 0.8 and 8.6 mA and synchrotron frequencies from 4.0 to 7.7 kHz. Relationships among these parameters and the associated energy curves were characterized in detail. Spectra of organosulphur and aromatic hydrocarbon compounds acquired using CSR exhibited absorption bands near 20 cm^{-1}, likely due to translational and rotational motion in dimers. The location and extent of usable CSR can be modified through adjustment of the ring energy, synchrotron frequency, and ring current, making this radiation suitable for acquisition of spectra at very low wavenumbers.

1. Introduction

Coherent synchrotron radiation (CSR) is emitted when the lengths of the electron bunches in a storage ring are reduced to dimensions similar to the radiation wavelength, typically about 1 mm [1,2]. CSR has been investigated in considerable detail at the Canadian Light Source (CLS) during the last decade. This research, extending from the microwave region to about 30 cm^{-1} (~1 THz), has characterized superradiance [3], and wakefields and resonances [4], using a high-resolution Fourier transform infrared (FT-IR) spectrometer. Practical applications of CSR at CLS include photoacoustic (PA) and transmission spectroscopy studies of solid materials [5,6]. CSR has similarly been

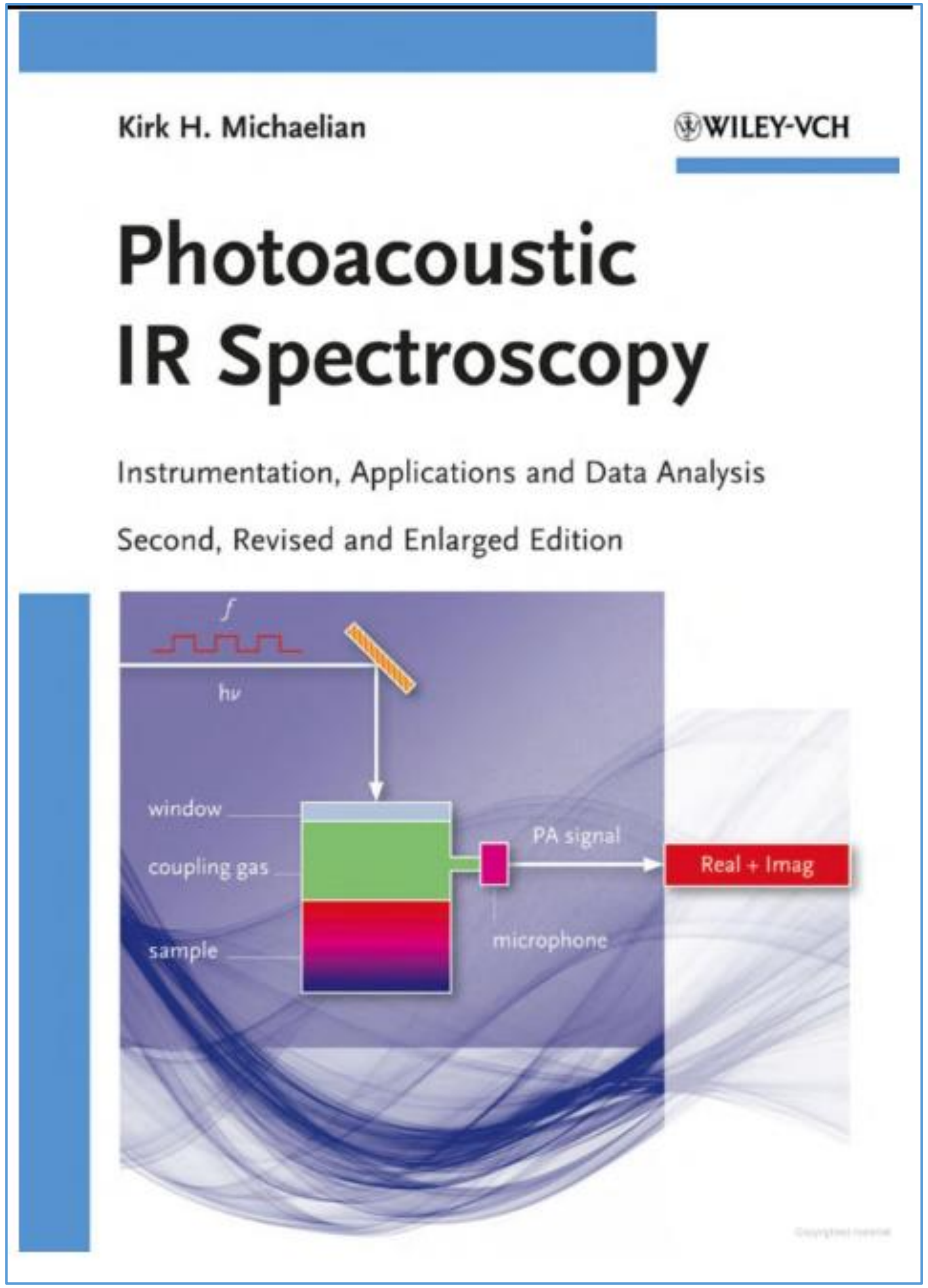
the previous CSR studies at CLS. Relationships among CSR energy distribution and machine conditions were also examined in this work, by varying the ring energy, synchrotron frequency and beam current. The locations and profiles of the CSR energy curves in these tests provide important information that can be used in future CSR spectroscopy studies.

2. Experimental

2.1. Spectroscopy measurements

Spectra were acquired using the Bruker IFS 125 HR FT-IR spectro-

Kirk also understood the advantages that SR brought for longer wavelength measurements – he wanted Far IR info on bitumen and other resource materials, and tried CSR for the brightest light possible for his measurements.



Kirk wrote the book on PAS…

‘nuff said.

CLS hosted WIRMS in 2009 at Banff AB, and Kirk wouldn’t miss it.

Dr. Ferenc Borondics, 2nd Mid IR scientist

With Dr. Ulli Schade of BESSY

Kirk receiving CLS Fellow Award from Dr. Jeff Cutler in Oct. 2018, after his retirement from NRCan