Synchrotron Infrared Science: Past, Present and Future*

G. Lawrence Carr
National Synchrotron Light Source
Brookhaven National Laboratory, Upton,
New York 11973-5000 USA
carr@bnl.gov

The development of infrared synchrotron radiation (IRSR) as a source began in the early 1980s, with emphasis on studies of materials under UHV conditions. Applications of IRSR expanded rapidly in the early 1990s with the development of feedback systems to stabilize the beam, and updated RF systems that reduced higher frequency noise. Though IRSR has been used for a variety of experimental techniques and over a broad spectral range, mid-IR microspectroscopy for chemical imaging has evolved to become the dominant experimental technique. Today, nearly all of the IRSR sources around the world include a microspectrometer endstation, and developments continue toward the goal of achieving higher spatial resolution while imaging larger areas. As with other fields of synchrotron science, advances are not limited to beamline designs and endstations. The drive towards producing shorter electron bunches for time-resolved spectroscopy and for VUV/x-ray FELs has opened the new field of accelerator-produced coherent THz pulses. Though still in its infancy, coherent THz synchrotron radiation (e.g., the Jefferson Lab FEL, BESSY-II, the NSLS SDL and others) has already been shown to possess significant power advantages over alternative sources, and new accelerator-based coherent light sources are being proposed (e.g., CIRCE, 4GLS). Though the expression may be overused, it nonetheless remains true: the future of infrared synchrotron radiation is bright.

* in collaboration with L.M. Miller, G.D. Smith, R.L. Smith, J.B. Murphy, X.-J. Wang, H. Loos, B. Sheehy, C.C. Homes, R.P.S.M. Lobo, D.B. Tanner, L. Mihaly, G.P. Williams, C.J. Hirschmugl and P. Dumas.