

Home

Online Library ACP

- Recent Final Revised Papers
- [Volumes and Issues](#)
- Special Issues
- Library Search
- Title and Author Search

Online Library ACPD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper

Impact
Factor
4.865

ISI
indexed



[Volumes and Issues](#) [Contents of Issue 20](#)

Atmos. Chem. Phys., 7, 5371-5390, 2007

www.atmos-chem-phys.net/7/5371/2007/

© Author(s) 2007. This work is licensed under a Creative Commons License.

Design of and initial results from a Highly Instrumented Reactor for Atmospheric Chemistry (HIRAC)

D. R. Glowacki¹, A. Goddard¹, K. Hemavibool¹, T. L. Malkin¹, R. Commane¹, F. Anderson¹, W. J. Bloss^{1,*}, D. E. Heard¹, T. Ingham¹, M. J. Pilling¹, and P. W. Seakins¹

¹School of Chemistry, University of Leeds, Leeds LS2 9JT, UK

* now at: School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK

Abstract. The design of a Highly Instrumented Reactor for Atmospheric Chemistry (HIRAC) is described and initial results obtained from HIRAC are presented. The ability of HIRAC to perform in-situ laser-induced fluorescence detection of OH and HO₂ radicals with the Fluorescence Assay by Gas Expansion (FAGE) technique establishes it as internationally unique for a chamber of its size and pressure/temperature variable capabilities. In addition to the FAGE technique, HIRAC features a suite of analytical instrumentation, including: a multipass FTIR system; a conventional gas chromatography (GC) instrument and a GC instrument for formaldehyde detection; NO/NO₂, CO, O₃, and H₂O vapour analysers. Ray tracing simulations and NO₂ actinometry have been utilized to develop a detailed model of the radiation field within HIRAC. Comparisons between the analysers and the FTIR coupled to HIRAC have been performed, and HIRAC has also been used to investigate pressure dependent kinetics of the chlorine atom reaction with ethene and the reaction of O₃ and t-2-butene. The results obtained are in good agreement with literature recommendations and Master Chemical Mechanism predictions. HIRAC thereby offers a highly instrumented platform with the potential for: (1) high precision kinetics investigations over a range of atmospheric conditions; (2) detailed mechanism development, significantly enhanced according to its capability for measuring radicals; and (3) field instrument intercomparison, calibration, development, and investigations of instrument response at a range of atmospheric conditions.

[Final Revised Paper](#) (PDF, 1046 KB) [Discussion Paper](#) (ACPD)

Citation: Glowacki, D. R., Goddard, A., Hemavibool, K., Malkin, T. L., Commane, R., Anderson, F., Bloss, W. J., Heard, D. E., Ingham, T., Pilling, M. J., and Seakins, P. W.: Design of and initial results from a Highly Instrumented Reactor for Atmospheric Chemistry (HIRAC), Atmos. Chem. Phys., 7, 5371-5390, 2007. [Bibtex](#) [EndNote](#) [Reference Manager](#)

Search ACP

Library Search

Author Search

News

- [Sister Journals AMT & GMD](#)
- [Financial Support for Authors](#)
- [Journal Impact Factor](#)
- [Public Relations & Background Information](#)

Recent Papers

01 | ACP, 23 Dec 2008: Corrigendum to "Modeling the effect of plume-rise on the transport of carbon monoxide over Africa with NCAR CAM" published in Atmos. Chem. Phys., 8, 6801-6812, 2008

02 | ACP, 23 Dec 2008: Lagrangian analysis of low altitude anthropogenic plume processing across the North Atlantic

03 | ACP, 23 Dec 2008: Interannual-to-decadal variability of the stratosphere during the 20th century: