

8-3-2010

Multi-Color Cavity Ringdown Based Detection Method and Apparatus

Scott Reeve

Susan Allen

Arkansas State University - Main Campus, allens17@erau.edu

Follow this and additional works at: <https://commons.erau.edu/db-mechanical-engineering>



Part of the [Mechanical Engineering Commons](#)

Scholarly Commons Citation

Reeve, S., & Allen, S. (2010). Multi-Color Cavity Ringdown Based Detection Method and Apparatus., (). Retrieved from <https://commons.erau.edu/db-mechanical-engineering/14>

This Patent is brought to you for free and open access by the College of Engineering at Scholarly Commons. It has been accepted for inclusion in Department of Mechanical Engineering - Daytona Beach by an authorized administrator of Scholarly Commons. For more information, please contact commons@erau.edu.



US007768647B2

(12) **United States Patent**
Reeve et al.

(10) **Patent No.:** **US 7,768,647 B2**
(45) **Date of Patent:** **Aug. 3, 2010**

(54) **MULTI-COLOR CAVITY RINGDOWN BASED
DETECTION METHOD AND APPARATUS**

2003/0189711 A1* 10/2003 Orr et al. 356/484
2004/0065816 A1 4/2004 Ye et al.

(75) Inventors: **Scott Reeve**, Jonesboro, AR (US); **Susan Allen**, Jonesboro, AR (US)

(73) Assignee: **Arkansas State University - Jonesboro**, State University, AK (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 433 days.

(21) Appl. No.: **11/756,876**

(22) Filed: **Jun. 1, 2007**

(65) **Prior Publication Data**

US 2009/0180119 A1 Jul. 16, 2009

Related U.S. Application Data

(60) Provisional application No. 60/803,757, filed on Jun. 2, 2006.

(51) **Int. Cl.**
G01N 21/00 (2006.01)

(52) **U.S. Cl.** **356/437**; 356/435

(58) **Field of Classification Search** 356/432-440;
73/23.3, 23.2, 23.31; 250/227.18, 343, 559.4,
250/345, 339.12-339.13

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,528,040 A 6/1996 Lehmann
6,075,252 A 6/2000 Atkinson et al.
6,975,190 B2 12/2005 Sato et al.

OTHER PUBLICATIONS

Biennier, L., F. Salama, M. Gupta, and A. O'Keefe, Multiplex integrated cavity output spectroscopy of cold PAH cations, *Chemical Physics Letters*, 387, 287-294 (2004).

Clapper, M., J. Demirgian, and G. Robitaille, A Quantitative Method using FTIR to Detect Explosives and Selected Semivolatiles in Soil Samples, *Spectroscopy*, 10(7), 44-49 (1995).

Ding, Y., P. Macko, D. Romanini, V.I. Perevalov, S.A. Tashkun, J.L. Teffo, S.M. Hu, and A. Campargue, High Sensitivity cw-Cavity Ringdown and Fourier Transform Absorption Spectroscopies of ¹³CO₂, *Journal of Molecular Spectroscopy*, 226, 146-160 (2004).

Esler, M.B., D.W.T. Griffith, S.R. Wilson, and L.P. Steele, Precision Trace Gas Analysis by FTIR Spectroscopy. I. Simultaneous Analysis of CO₂, CH₄, N₂O and CO in air, *Analytical Chemistry*, 72(1), 206-215 (2000).

Fiedler, S.E., A. Hese, and A.A. Ruth, Incoherent broad-band cavity enhanced absorption spectroscopy, *Chemical Physics Letters*, 317, 284-294 (2003).

(Continued)

Primary Examiner—Gregory J Toatley, Jr.

Assistant Examiner—Tri T Ton

(74) *Attorney, Agent, or Firm*—Joe D. Callhoun; Rashauna A. Norment

(57) **ABSTRACT**

A multi-color cavity ringdown based spectrometer is housed in a light tight enclosure to detect the presence of trace quantities of gas phase molecules emanating from explosives, drugs, or hazardous materials being transported through the enclosure or compounds contained in a patient's breath. A method is also disclosed for detecting gas phase molecules emanating from explosives, drugs, hazardous materials, or a patient's breath.

20 Claims, 8 Drawing Sheets

