



US008654326B2

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

(10) **Patent No.:** **US 8,654,326 B2**  
(45) **Date of Patent:** **Feb. 18, 2014**

(54) **COMPACT, LOW COST RAMAN MONITOR FOR SINGLE SUBSTANCES**

(58) **Field of Classification Search**  
USPC ..... 356/302, 631, 603; 700/119, 117, 97, 700/103  
See application file for complete search history.

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/013,359**

(22) Filed: **Aug. 29, 2013**

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(65) **Prior Publication Data**

US 2014/0002818 A1 Jan. 2, 2014

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**Related U.S. Application Data**

(63) Continuation of application No. 13/547,469, filed on Jul. 12, 2012, now Pat. No. 8,553,221, which is a continuation-in-part of application No. 13/361,072, filed on Jan. 30, 2012, now Pat. No. 8,339,598, which is a continuation of application No. 13/165,333, filed on Jun. 21, 2011, now Pat. No. 8,125,635, which is a continuation of application No. 11/923,571, filed on Oct. 24, 2007, now Pat. No. 7,982,869.

(60) Provisional application No. 60/854,339, filed on Oct. 24, 2006.

(57) **ABSTRACT**

Apparatus for performing Raman spectroscopy may include a first laser source having a first emission wavelength and a second laser source having a second emission wavelength. A separation between the first and second emission wavelengths may correspond to a width of a Raman band of a substance of interest. A switch may provide switching between the first and second laser sources. An ensemble of individually addressable laser emitters may be provided. A Bragg grating element may receive laser light from the ensemble. An optical system may direct light from the Bragg grating element into an optical fiber. A combined beam through the optical fiber may contain light from each of the emitters.

(51) **Int. Cl.**  
**G01J 3/44** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **356/301**; 356/302; 356/603; 356/631; 700/103; 700/97; 700/119

**20 Claims, 9 Drawing Sheets**

