



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

(10) **Patent No.:** **US 7,719,268 B2**  
(45) **Date of Patent:** **\*May 18, 2010**

(54) **APPARATUS AND METHOD FOR  
POLARIZING POLARIZABLE NUCLEAR  
SPECIES**

5,642,625 A 7/1997 Cates, Jr. et al.  
6,434,284 B1 8/2002 Savchenko  
6,949,169 B2 \* 9/2005 Hersman et al. .... 204/155  
2002/0107439 A1 \* 8/2002 Hersman et al. .... 600/410  
2005/0245815 A1 \* 11/2005 Hersman et al. .... 600/410

(76) Inventors: **F. William Hersman**, 66 Bucks Hill Rd.,  
Durham, NH (US) 03824; **Mark  
Leuschner**, 42 Lamprey St., Newmarket,  
NH (US) 03857; **Jeannette Carberry**, 6  
Clay St., Merrimack, NH (US) 03054

(Continued)

(\* ) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 1314 days.

**FOREIGN PATENT DOCUMENTS**

WO WO 99/34189 7/1999

This patent is subject to a terminal dis-  
claimer.

**OTHER PUBLICATIONS**

European Search Report, Apr. 14, 2004.

(21) Appl. No.: **11/148,699**

(Continued)

(22) Filed: **Jun. 9, 2005**

(65) **Prior Publication Data**

*Primary Examiner*—Louis M Arana  
(74) *Attorney, Agent, or Firm*—Devine, Millimet & Branch,  
P.A.; Paul C. Remus; Raymond I. Bruttomesso, Jr.

US 2005/0245815 A1 Nov. 3, 2005

**Related U.S. Application Data**

(57) **ABSTRACT**

(62) Division of application No. 09/904,294, filed on Jul.  
12, 2001, now Pat. No. 6,949,169.

(60) Provisional application No. 60/217,569, filed on Jul.  
12, 2000.

(51) **Int. Cl.**  
**G01V 3/00** (2006.01)

(52) **U.S. Cl.** ..... **324/304; 324/305**

(58) **Field of Classification Search** ..... 324/304,  
324/305

See application file for complete search history.

The present invention is a polarizing process involving a  
number of steps. The first step requires moving a flowing  
mixture of gas, the gas at least containing a polarizable  
nuclear species and vapor of at least one alkali metal, with a  
transport velocity that is not negligible when compared with  
the natural velocity of diffusive transport. The second step is  
propagating laser light in a direction, preferably at least par-  
tially through a polarizing cell. The next step is directing the  
flowing gas along a direction generally opposite to the direc-  
tion of laser light propagation. The next step is containing the  
flowing gas mixture in the polarizing cell. The final step is  
immersing the polarizing cell in a magnetic field. These steps  
can be initiated in any order, although the flowing gas, the  
propagating laser and the magnetic field immersion must be  
concurrently active for polarization to occur.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

3,904,272 A 9/1975 Straka  
4,793,357 A 12/1988 Lindstrom  
5,545,396 A 8/1996 Albert et al.  
5,617,859 A 4/1997 Souza et al.

**4 Claims, 6 Drawing Sheets**

