



US006896846B1

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

(10) **Patent No.:** US 6,896,846 B1
(45) **Date of Patent:** May 24, 2005

(54) **SYNTHESIS OF ORTHOPAEDIC IMPLANT MATERIALS**

(75) Inventors: **Arvind Varma**, Granger, IN (US);
Alexander Mukasyan, Mishawaka, IN (US); **Bing-Yun Li**, Ruston, LA (US)

(73) Assignee: **University of Notre Dame**, Notre Dame, IN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 223 days.

(21) Appl. No.: **10/284,435**

(22) Filed: **Oct. 31, 2002**

Related U.S. Application Data

(60) Provisional application No. 60/335,326, filed on Nov. 2, 2001.

(51) **Int. Cl.**⁷ **B22F 3/00**

(52) **U.S. Cl.** **419/45; 75/228; 75/232; 75/236; 75/246**

(58) **Field of Search** **419/45; 75/228, 75/232, 236, 246**

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,131,450 A * 12/1978 Saito et al. 75/352
5,143,668 A * 9/1992 Hida 264/649
5,145,619 A * 9/1992 Abramovici 264/649
5,718,844 A * 2/1998 Krynitz et al. 252/513

* cited by examiner

Primary Examiner—Daniel Jenkins

(74) *Attorney, Agent, or Firm*—Jagtiani + Guttag

(57) **ABSTRACT**

A method for synthesis of biomedical alloys has been developed based on combustion phenomena. This low pressure combustion synthesis (LPCS) technique may be used for production of Co-based and other metal-based alloys, which cover the entire range of orthopaedic implants, including total hip and knee replacements, as well as bone screws, plates, and wires. A unique aspect of the method is that combustion synthesis under low ambient gas pressure allows one to produce pore-free (>99% theoretical density) alloys with high purity and precise chemical and phase compositions.

52 Claims, 9 Drawing Sheets

