US005607683A

United States Patent [19]

Capelli

[11] **Patent Number: 5,607,683**

[45] **Date of Patent: *Mar. 4, 1997**

[54] **ANTIMICROBIAL COMPOSITIONS USEFUL FOR MEDICAL APPLICATIONS**

[76] Inventor: **Christopher C. Capelli**, 4500 7th St., Kenosha, Wis. 53142

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,326,567.

[21] Appl. No.: **483,815**

[22] Filed: **Jun. 7, 1995**

Related U.S. Application Data

[63] Continuation of Ser. No. 268,616, Jul. 1, 1994, which is a continuation-in-part of Ser. No. 82,168, Jun. 28, 1993, Pat. No. 5,326,567, which is a continuation of Ser. No. 683,436, Apr. 10, 1991, abandoned.

[51] **Int. Cl.**[6] **A01N 25/00**; A01N 59/08; A61L 15/16; A61K 33/14

[52] **U.S. Cl.** **424/405**; 424/404; 424/422; 424/423; 424/430; 424/431; 424/432; 424/443; 424/445; 424/446; 424/78.06; 424/78.07; 424/609; 424/618; 424/663; 424/669; 424/723; 514/495; 523/122; 604/265

[58] **Field of Search** 424/404, 405, 424/422, 423, 430, 432, 443, 486, 618, 609, 669, 663, 722, 723, 678, 679, 680, 670; 514/495; 604/265; 523/105, 113, 122, 111

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,006,870	10/1961	Steinfatt et al.	260/2.5
3,092,552	6/1963	Romans	424/404
3,531,433	9/1970	Elmer et al.	260/45.8
3,639,575	2/1972	Schmolka et al.	424/78
3,645,950	2/1972	Stratta	260/29.2
4,054,139	10/1977	Crossley	128/260
4,181,786	1/1980	Mune et al.	525/327
4,263,424	3/1981	Buckley et al.	528/85
4,376,764	3/1983	Schmolka	424/78
4,393,871	7/1983	Vorhauer et al.	609/58
4,451,447	5/1984	Kaplan et al.	424/131
4,451,635	5/1984	Gould et al.	528/71
4,460,369	7/1984	Seymour	601/897
4,563,184	1/1986	Korol	514/936
4,579,731	4/1986	Fox, Jr. et al.	424/28
4,581,028	4/1986	Fox, Jr. et al.	623/2
4,587,310	5/1986	Ogoe et al.	525/462
4,588,400	5/1986	Ring et al.	514/781
4,603,152	7/1986	Laurin et al.	604/265
4,654,334	3/1987	Williams et al.	514/184
4,677,143	6/1987	Laurin et al.	523/122
4,693,992	9/1987	Young	514/11
4,728,323	3/1988	Matson	604/304
4,843,138	6/1989	Tazewell et al.	528/52
4,933,178	6/1990	Capelli	424/78
4,938,955	7/1990	Niira et al.	424/618
5,019,096	5/1991	Fox, Jr. et al.	623/1
5,047,448	9/1991	Tanaka et al.	523/122
5,073,365	12/1991	Katz et al.	424/489
5,292,516	3/1994	Viegas et al.	424/423
5,296,518	3/1994	Grasel et al.	521/176
5,326,567	7/1994	Capelli	424/405
5,328,954	7/1994	Sarangapani	524/589
5,344,411	9/1994	Domb et al.	604/265

FOREIGN PATENT DOCUMENTS

3523032	1/1987	Germany .
WO-A-92 13906	8/1992	WIPO .

OTHER PUBLICATIONS

Yanagida et al., "Metal–Ion Complexation of Noncyclic Poly(oxyethlene) Derivatives, I. Solvent Extraction . . . ", Soc. Bulletin Chem., Japan, 50(6):1386–1390, (1977).

Yanagida et al., "Metal–Ion Complexation of Noncyclic Poly(oxyethylene) Derivatives, II. PMR Studies . . . ", Soc. Bulletin Chem., Japan 51(5): 1294–1299, (1978).

Sotobayashi, "Liquid–Liquid Extraction of Some Actinides With Polyehtleneglycol & Derivatives", J. Radioanalytical Chem., 36:145–152, (1977).

Saenger et al., "Wrapping of Metal Cations by Linear Polyethers", Israel J. of Chem., 18–253–258 (1979).

Kolthoff, "Application of Macrocyclic Compounds in Chemical Analysis", Analytical Chem., 51(5):1R–22R.

Frendsdorff, "Salt Complexes of Cyclic Polyethers . . . ", J. Am. Chem. Society, 93(19):(1971).

Pederson, "Cyclic Polyethers and Their Complexes with Metal Salts", J. Am. Chem. Society, 89:26 (1967).

Paik Sung et al., "ESCA Studies of Surface Chemical Compositions of Segmented Polyurethanes", J. Biomed. Mat. Research, 13:161–171, (1979).

Chow et al., "The Extraction and Determination of Thiocyanate Complexes by Use of Polyurethane Foam", Talanta, 30(8) 620–622, (1983).

Weber et al., "Spherical Wrapping of a Linear Polyether around a Cation . . . ", Angew. Chem. Int. Ed. Engl., 18(3): 226–227 (1979).

Weber et al., "S–Shaped Binuclear Cation Complex of a Linear Polyether . . . ", Angew. Chem. Int. Ed. Engl. 18(3): 227–228 (1979).

Hamon et al., "The Caton–Chelation Mechanism of Metal–ion Sorption By Polyurethanes", Talanta, 29:313–326 (1982).

Iwamoto et al., "Structure of Poly(ethylene Oxide) Complexes . . . ", J. Polymer Sci., 6(A2): 1509–1525 (1968).

(List continued on next page.)

Primary Examiner—Amy Hulina
Attorney, Agent, or Firm—Foley & Lardner

[57] **ABSTRACT**

Antimicrobial metal-based compositions, which are photostable, non-staining, and which are easily absorbed into lipophilic matrices, contain silver cations, complexed by acyclic polyether polymers through the formation of a "host-guest relationship" where the acyclic polyether is the "host" and the silver cation is the "guest," wherein stabilization of this "host-guest relationship" is accomplished through the use of excess anions. The compositions are useful for topical treatment of infections caused by bacteria, fungus and viruses in humans and animals and for treating medical devices, foams and adhesives to impart infection-resistance.

16 Claims, No Drawings