US005744704A

United States Patent [19]

Hu et al.

[11] Patent Number: 5,744,704

[45] Date of Patent: Apr. 28, 1998

[54] **APPARATUS FOR IMAGING LIQUID AND DIELECTRIC MATERIALS WITH SCANNING POLARIZATION FORCE MICROSCOPY**

[75] Inventors: **Jun Hu**, Berkeley; **D. Frank Ogletree**; **Miguel Salmeron**, both of El Cerrito, all of Calif.; **Xudong Xiao**, Kowloon, China

[73] Assignee: **The Regents, University of California**, Oakland, Calif.

[21] Appl. No.: **476,441**

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

[51] **Int. Cl.**[6] **G01B 7/34**

[52] **U.S. Cl.** **73/105**; 250/306

[58] **Field of Search** 73/105; 250/306, 250/307

[56] **References Cited**

U.S. PATENT DOCUMENTS

5,066,858	11/1991	Elings et al.	250/306 X
5,128,544	7/1992	Iwatsuki	250/306
5,136,162	8/1992	Miyomoto et al.	250/307 X
5,281,814	1/1994	Weiss et al.	250/307 X
5,283,437	2/1994	Greschner et al.	250/306
5,397,896	3/1995	Weiss et al.	250/306
5,400,647	3/1995	Elings	73/105
5,468,959	11/1995	Tohda et al.	73/105 X
5,495,109	2/1996	Lindsay et al.	250/306

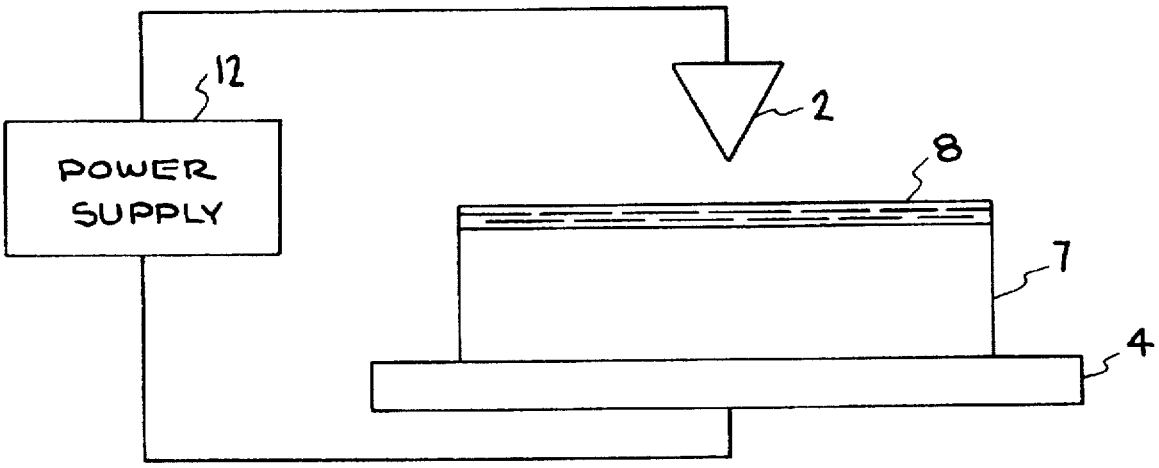
FOREIGN PATENT DOCUMENTS

304103	12/1988	Japan	73/105
369418	12/1992	Japan	73/105

Primary Examiner—Thomas P. Noland

Attorney, Agent, or Firm—Pepi Ross; Paul R. Martin

[57] **ABSTRACT**

The invention images dielectric polarization forces on surfaces induced by a charged scanning force microscope (SFM) probe tip. On insulators, the major contribution to the surface polarizability at low frequencies is from surface ions. The mobility of these ions depends strongly on the humidity. Using the inventive SFM, liquid films, droplets, and other weakly adsorbed materials have been imaged.

6 Claims, 5 Drawing Sheets