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# United States Patent [19]

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[54] **THIN FILM FERROELECTRIC FLAT PANEL DISPLAY DEVICES, AND METHODS FOR OPERATING AND FABRICATING SAME**

[75] Inventors: **Orlando H. Auciello**, Cary; **Gary E. McGuire**, Chapel Hill, both of N.C.

[73] Assignee: **MCNC**, Research Triangle Park, N.C.

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*Primary Examiner*—Robert J. Pascal

*Assistant Examiner*—Haissa Philogene

*Attorney, Agent, or Firm*—Bell, Seltzer, Park & Gibson

[57] **ABSTRACT**

A flat panel display includes a ferroelectric thin film between first and second spaced apart electrodes. The ferroelectric thin film emits electrons upon application of a predetermined voltage between the first and second spaced apart electrodes. The electrons are emitted in an electron emission path and impinge upon a luminescent layer such as a phosphor layer, which produces luminescence upon impingement upon the emitter electrodes. The ferroelectric thin film is preferably about 2 μm or less in thickness and is preferably a polycrystalline ferroelectric thin film. More preferably, the thin ferroelectric film is a highly oriented, polycrystalline thin ferroelectric film. Most preferably, highly oriented ferroelectric thin film has a preferred (001) crystal orientation and is about 2 μm or less in thickness. A flat panel display may be formed of arrays of such display elements. Top and bottom electrodes or side electrodes may be used. The display may be formed using conventional microelectronic fabrication steps.

**41 Claims, 12 Drawing Sheets**

