

## OFFICE OF TECHNOLOGY TRANSFER AND ENTERPRISE DEVELOPMENT

# Polar Liquid Crystals with High Dielectric Anisotropy

### Summary

Vanderbilt inventors have developed a new class of liquid crystals with high dielectric anisotropy.

### Description

The optical effect in Liquid Crystal Displays (LCD) is caused by reorientation of molecules of the liquid crystals upon application of an electric field. This electro-optical effect requires materials with dielectric anisotropy  $\Delta\epsilon$ , and the larger the  $\Delta\epsilon$ , the lower the threshold voltage for the molecular realignment.

A new class of liquid crystals containing boron in their structure has been developed. The materials have high dielectric anisotropy ( $\Delta\epsilon > 40$ ), which results in low threshold voltages. The strategy used in the current invention overcomes the twin limitations posed by (a) low compatibility of the polar additive with the nematic host and (b) low solubility of polar mesogenic heterocycles and zwitterionic additives.

The current stage of development of this technology is proof of concept, and some synthesis routes have been explored.

Liquid crystal technology is now commonplace with LCDs being found in calculators, watches, telephones, radios and car dashboards, and larger, full-color displays can be found in laptop computer screens and LCD TV sets. Liquid crystals touch our lives every day, as they are the basis of flat-panel displays for communication devices and mobile data processing systems. The likely market for this type of technology is the World Flat Panel Display (FPD) market.

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### Competitive Analysis

In 2007, the LCD TV market stood at 80.4 million units, with revenues reaching \$70 billion. With the falling prices and developing technology trends, the LCD TV market unit shipment is projected to reach 337.1 units by the end of 2014, growing at a compound annual growth rate of 22.7% between 2007 and 2014.

### Strategic Plan

Vanderbilt University intends to continue research and development of this concept. Concurrently, Vanderbilt solicits licensing and technical interest from industrial concerns for eventual commercialization of this technology.



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