Delaware Economic Development Office dedo.delaware.gov Innovation@work.

Diamond fiber field emitters

Description of Technology: Field emission electron sources, often referred to as field emission materials or field emitters, can be used in a variety of electronic applications, e.g., vacuum electronic devices, flat panel computer and television displays, emission gate amplifiers, and klystrons. Field emitters of etched silicon or silicon microtips have been known (see Spindt et al., "Physical Properties of Thin Film Emission Cathodes", J. Appl. Phys., vol. 47, pp. 5248, 1976), but require expensive and elaborate fabrication techniques. Additionally, such field emission cathodes suffer from relatively short lifetimes due to erosion of the emission surfaces from positive ion bombardment.

Patent Listing:

1. **US Patent No.** 5,578,901, Issued on November 26, 1996, "Diamond fiber field emitters."
   http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=5,578,901.PN.&OS=PN/5,578,901&RS=PN/5,578,901

Market Potential: Despite the recent advances, further improvements in current densities and electron emission efficiency of field emitters are believed necessary to reduce power consumption requirements in most applications. Other improvements are needed in reproducibility of the emitters, in the lifetimes of the emitters and in reduced fabrication costs of the emitters.

In fabricating electronic devices, such as a flat panel display, field emitters have typically been formed as small flat plates, often referred to as cold cathodes. Several such small flat plates have then been pieced together in the fashion of tiles to provide the electron emission for a larger flat panel display. This leads to distinct lines or gaps in the emission pattern around the edges of the small flat plates or tiles. There are presently no techniques to fabricate a field emitter having greater than about a few square inches in surface area. Accordingly, the ability to readily and easily fabricate field emitters having a surface area of greater than a few square inches, e.g., a surface area the size of the ever larger display, e.g., television, screen sizes, is desirable. Despite the level of industrial activity in the area of field emission of electrons, numerous problems and difficulties remain.

Benefits:

- Less expensive than normally used field emitters.
- Longer life span of field emitters.

Applications:

- Flat panel computer and television displays
- Vacuum electronic devices
- Emission gate amplifiers
- Klystrons

Contact:
Delaware Economic Development Office
Direct: (302) 577-8477, Fax: (302) 577-8499