Field Emission from Organic Conductors

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Field emission devices have been used in a large number of applications, including chemical analysis, space propulsion, e-beam lithography, and display devices. In the displays market, which is probably the largest for any of these applications, field emission devices have failed to make an impact outside of several highly specialized applications because of the high unit and capital cost of the two most popular types of devices, the Spindt cathode and silicon field emitter arrays. The Spindt cathode relies on an expensive, directional metal deposition, while silicon field emitter arrays require high temperature oxidation and numerous plasma etch and deposition steps.

This work is exploring the fabrication of field emitters using organic conductors that we believe can achieve the same performance as expensive silicon and refractory metal field emitters in a simple, solution-based, near room-temperature process. Other groups have shown that thin organic films can show field emission. We hope to form patterned tips instead, with a high electron emission density and high durability. Success with this process would make a new class of field emitters possible with a low capital and unit cost. Low temperature processing would also allow integration of these emitters in a broader range of applications. Preliminary results show that field emission is possible (Figure 32), but work remains to identify appropriate material systems and processing technologies.

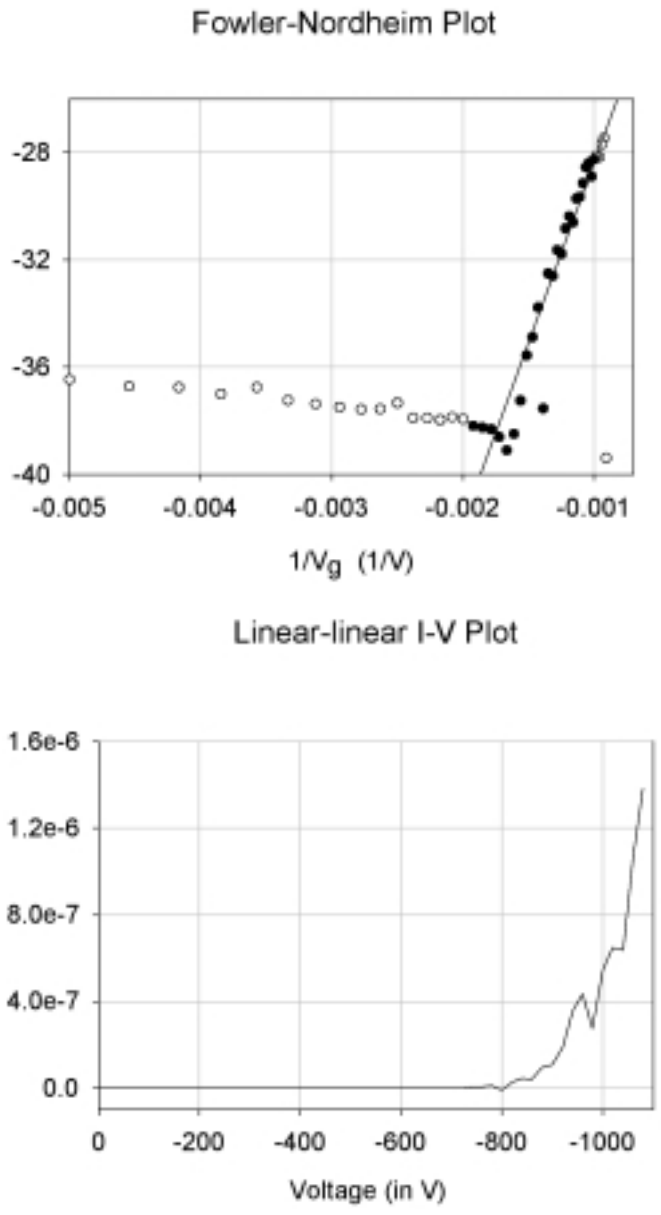

Fig. 32: Field emission from a prototype organic field emission device