Hole Blocking Mechanism in High-gain Avalanche Rushing Amorphous Photoconductor Film

Physica Status Solidi C, Vol. 8, Issue 9, 2011, pp. 2800-2803
Kenji Kikuchi, Yuji Ohkawa, Kazunori Miyakawa, Tomoki Matsubara, Kenkichi Tanioka, Misao Kubota, and Norifumi Egami

HARP photoconductive film made of amorphous selenium (a-Se)makes use of the avalanche multiplication phenomenon and has been developed for the ultrahigh-sensitivity television cameras that are used to report breaking news at night or to produce nature and science programs. In the present work, we have tried to reveal the hole-blocking mechanism in HARP films to improve their characteristics. It is important to reduce the dark current in HARP film to improve its sensitivity. HARP film has a hole-blocking layer to suppress dark current, which interrupts the injection of holes to the a-Se layer. Hole injection is considered to be one of the main factors related to dark current. The hole-blocking layer consists of cerium dioxide (CeO_2), which is an n-type wide-gap material. We have recently succeeded in producing improved CeO_2 whose hole-blocking capabilities are superior to the abilities of conventional normal CeO_2. This paper describes the hole-blocking mechanism in HARP film. To investigate this, the relationship between dark current and the film thickness of the CeO_2 layer were measured with each HARP film using the two different types of CeO_2. Furthermore, we analyzed the Ce 3d core-level photoemission spectra for both types of CeO_2 layers in HARP film by using hard X-ray photoelectron spectroscopy (HAX-PES) at Spring-8. As a result, we found that the hole-blocking capabilities of the film could be improved by reducing the number of defect levels generated from oxygen vacancies in the CeO_2 hole-blocking layer.

Electrostatic Focusing Spindt-type Field Emitter Array for an Image Sensor with a High-gain Avalanche Rushing Amorphous Photoconductor Target

Journal of Vacuum Science & Technology B, Vol.29, Issue4, 2011, pp.04E104.1- 04E104.5
Yuki Honda, Yoshiro Takiguchi, Norifumi Egami, Masakazu Nanba*, Yoshihisa Saishu**, Kazuhito Nakamura**, and Masateru Taniguchi**
*NHK Engineering Services, Inc.
**Futaba Corporation

A new electrostatic focusing Spindt-type field emitter array (FEA) was simulated and fabricated to develop a compact FEA image sensor with a high-gain avalanche rushing amorphous photoconductor target. Although the conventional double-gated FEAs can generate focused electron beams by applying a lower voltage to the focusing electrode (second gate) than that of the gate electrode, the emission current drastically decreases. These experimental results show that by increasing the thickness of the gate electrode the emission current can be improved without deterioration of the focusing characteristics.