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Vacuum Packaging and Operating Properties of Micro-Tunneling Sensors

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Abstract

Cantilever-shaped lateral field emitters were fabricated and their electrical characteristics were tested. As shown in Fig.1, poly-silicon cantilevers were fabricated by the surface micromachining and they were used to the vacuum magnetic field sensors. The tunneling devices were vacuum sealed with the tubeless packaging method, as shown in Fig.2 and Fig.3. The soda-lime glasses were used for better encapsulation, so the sputtered silicon and the glass layers on the soda-lime glasses were bonded together at $1x10^{-6}$ Torr. The getter was activated after the vacuum sealing for the stable emissions. The devices were tested outside of the vacuum chamber. Through vacuum packaging, the tunneling sensors can be utilized. Fig.4 shows that the sensor operates with the switching of the magnetic field. When the magnetic field was applied to the device, the anode currents were varied by the Lorentz force. The difference of anode currents can be varied with the strength of the applied magnetic field.

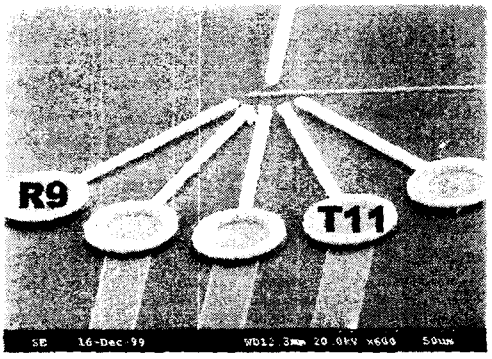

Fig.1 VMS(vacuum magnetic sensor) device as sensor applications of the tunneling device

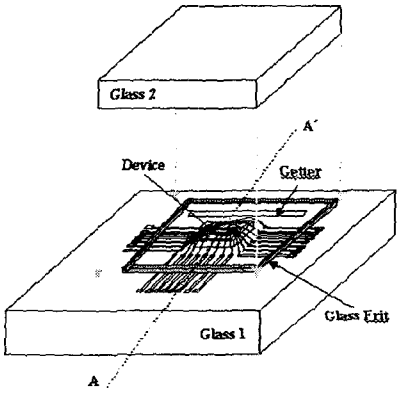

Fig.2 Exploded-view of the vacuum packaging

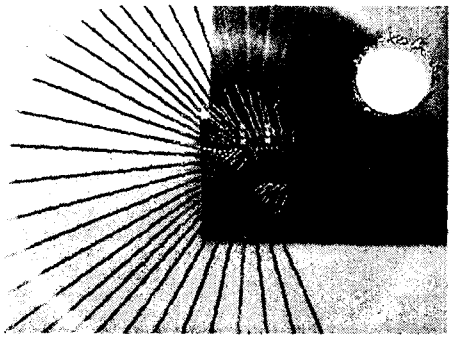

Fig.3 Photograph of the vacuum-sealed device by the tubeless packaging method

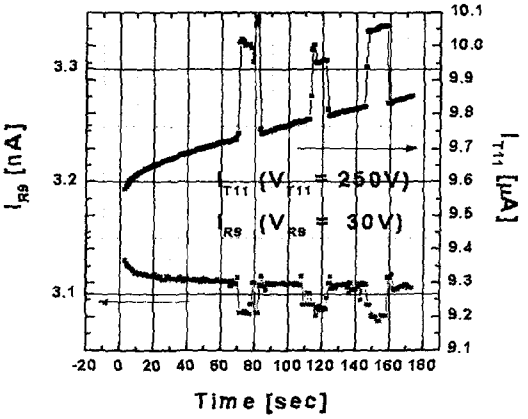

Fig.4 Anode current variations with/ without a magnetic field (T11 anode was biased at 250V, while the R9 anode was biased at 30V)