

Study on Hydrogen Detection by Schottky Diode Sensors

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INTRODUCTION

The hydrogen sensors based on Schottky diodes have been attracted much attention in recent years. In this work, a novel technique, i.e., electroless plating, was employed to deposit Pd film on the InP substrate for Schottky junction. The hydrogen sensing performance was studied. Furthermore, the detection mechanism was investigated from the theoretical and experimental aspects.

EXPERIMENTAL

The Pd/InP Schottky diode hydrogen sensors were fabricated on n-InP epi-layer film with $1 \times 10^{16} \text{ \#/cm}^3$. After cleaning the substrate by acetone and methanol, the AuGe film with thickness of 0.2 \mu m was deposited by thermal evaporation and subsequently sintered at $350 \text{ }^\circ\text{C}$ to serve as Ohmic contact. Then, the Pd film was deposited at $30 \text{ }^\circ\text{C}$ by electroless plating for Schottky contact.

RESULTS AND DISCUSSION

The I - V characteristic curves for the demonstrated Pd/InP diode under hydrogen concentrations ranging from 15 ppm to 1 % were shown in Figure 1. As can be seen, even at 15 ppm, the change in current was significant. It demonstrated the diode sensors have high sensitivity to hydrogen. Furthermore, the plot of $1/\ln(I_{0,H_2}/I_0)$ versus $C_{H_2}^{-0.5}$ indicated two linear regions with different slopes. As seen in Figure 2, small slope occurred at high hydrogen concentration, while large slope was at low concentration. From the result, it demonstrated that the mechanism for hydrogen detection at high concentration was in agreement with that proposed by Kang [1]. However, at low concentration, the large slope revealed the hydrogen detection mechanism was changed.

REFERENCE

1. W. P. Kang and Y. Gurbuz, *J. Appl. Phys.*, **75**, 12 (1994).

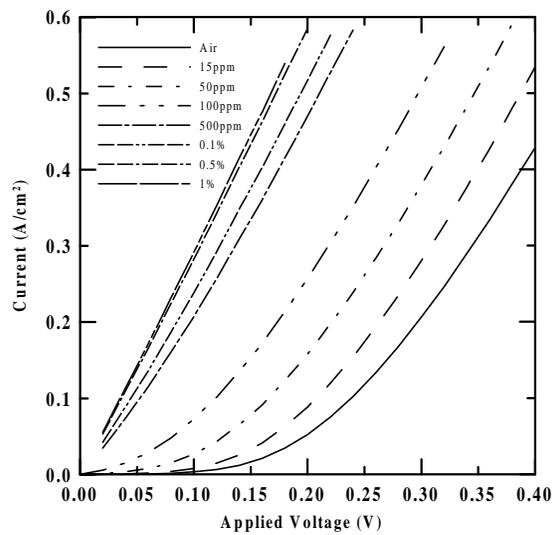


Figure 1 The I - V characteristic curves of Pd/InP diode sensor under various hydrogen concentrations.

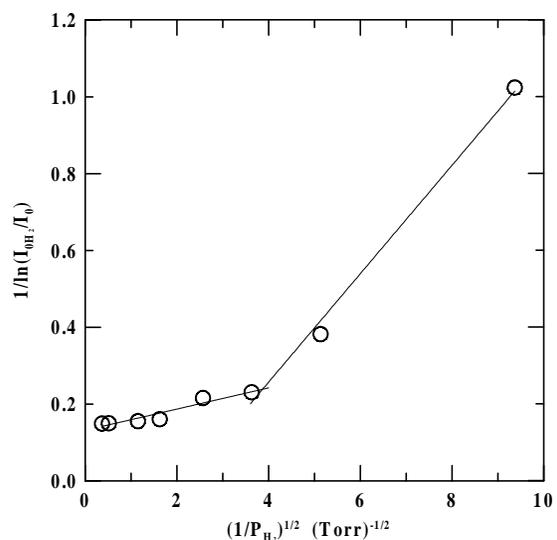


Figure 2 Plot of $1/\ln(I_{0,H_2}/I_0)$ versus $C_{H_2}^{-0.5}$.