

Pd/GaAs Schottky Diodes Fabricated by Electroless Plating

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INTRODUCTION

It has been noticed that the Schottky diodes fabricated by electroless plating demonstrate excellent electric characteristics competing with conventional thermal evaporation. In this work, the electroless plating technique is used to deposit Pd film on GaAs substrate to form a Schottky contact. Effects of the plating composition on Schottky diode characteristics and the surface morphology of the Pd film are investigated. Furthermore, the Schottky barrier heights and the ideality for each diode are also revealed.

EXPERIMENTAL

An *n*-type GaAs epi-layer film grown on a semi-insulating GaAs was used as the substrate of the Pd/GaAs Schottky diode device. The AuGe film was deposited by thermal evaporation and subsequently sintered at 350°C for Ohmic contact. Then, the Pd film was deposited on a confined area of GaAs substrate. The composition of the plating bath with concentration 1X was shown in Table 1. Different concentrations (0.75X, 0.25X, 0.125X) were used for plating in this study.

RESULTS AND DISCUSSION

As shown in Figure 1, the Pd/GaAs diode device fabricated by electroless plating at low concentration has larger turn-on voltage. Furthermore, the Schottky barrier height (SBH) increases with decreasing the plating concentration. Particularly, the SBH for Pd/GaAs diode plated with concentration 0.125X is close to the theoretical ideal value (1050 meV). Comparing the Pd crystalline grains in Figure 2(a) and (b), it is found that the Pd film with smaller grain size is obtained with lower plating concentration, and therefore exhibits high-performance Schottky diode characteristics.

CONCLUSION

By electroless plating at low concentration, the Pd/GaAs device shows high-performance Schottky diode characteristics.

Table 1 The composition of plating bath (Concentration: 1X).

NH ₄ OH	390 ml/l
Na ₂ EDTA	70 g/l
PdCl ₂	5.4 g/l
N ₂ H ₄	100 ml/l
Plating temperature	30°C

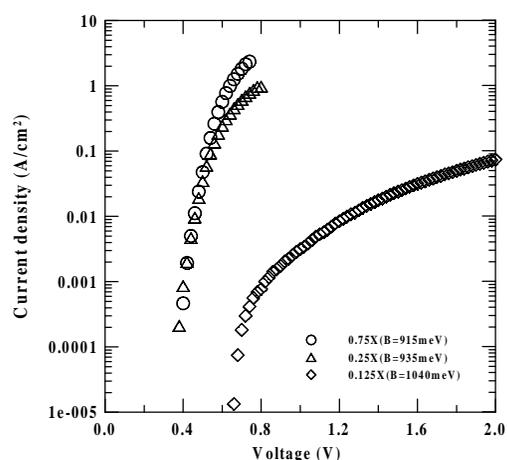
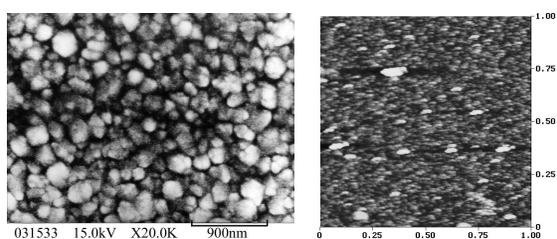


Figure 1 Electric characteristics for Pd/GaAs diodes fabricated by different plating concentrations.



(a) SEM observation (b) AFM observation
Figure 2 Surface morphologies for Pd films deposited with (a) concentration 0.75X, and (b) concentration 0.125X, respectively.