PLD-DBD 공정으로 제작된 비정질 Zn 산화물 박막트랜지스터의 안정성 향상

Stability enhancement of armorphous znic oxide thin film transistors fabricated by pulsed laser deposition with DBD

전윤수[1], 정유진[1,2], 조경철[1], 김승환[1], 정다운[1], 이상렬[1,2]*
Yoon-Soo Chun[1,2], Eu-Gene Chong[1,2], Kyoung-Chol Jo[1], Seung-Han Kim[1], Da-Woon Jung[1], Sang-Yeol Lee[1,2*]

[1]한국과학기술연구원 전자재료센터, [2]과학기술연합대학원 대학교 나노전자소자공학과
[1]Electronic Materials Center, Korea Institute of Science and Technology,
[2]Nanoelectronics, University of Science and Technology

Abstract : The stability enhancement of Znic oxide thin film transistor deposited by PLD-DBD has been reported here using the bias temperature stress test. Znic oxide (ZnO) thin films were deposited on SiO_2/Si (100) by pulsed laser deposition method with and without dielectric barrier discharge (DBD) method. The DBD is the efficient method to adopt the nitrogen ions into the thin films. The TFT characteristics of ZnO TFTs with and without Nirogen (N) doping show similar results with $I_{on/off}$ of 10^5~10^6. However, the bias temperature stress (BTS) test of N-doped ZnO TFT with DBD shows higher stability than that of ZnO TFT.

Key Words : PLD, DBD, Stability, ZnO, Oxide TFT

1. Introduction

Nitrogen doping on ZnO thin film has been researched to make p-type ZnO and there have been a few success of making p-type ZnO with N-doping.[1-4] However, there have been few researches about the effect of N-doping on the stability and transistor characteristics of ZnO TFT, especially using the DBD as the N doping method.

2. Results and Discussion

The annealing above 300°C after ZnO channel layer patterning shows the transistor characteristics of ZnO TFT. The transfer characteristic measurements of N-doped ZnO TFT by DBD method shows $I_{on/off}$ of 10^5, which is 0.5~1 order smaller than that of ZnO TFT, which indicates that N-dopents are acted as acceptor and suppress the carrier in the channel. The on/off current ratio of N-doped ZnO TFT doesn't changed after a certain annealing temperature, which is 300°C for this work. Despite the $I_{on/off}$ results, the stability of N-doped ZnO TFT shows superior result compare to that of ZnO TFT under the bias temperature stress (BTS) test at 60°C. The V_{th} of ZnO TFT shifted more than 10 V, but N-doped ZnO TFT shows less than 1 V shift of V_{th} under BTS test. These results indicate that the N-doping by DBD has a effect of improving the stability, which is may due to the reducing the interface traps.

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† 교신저자) 이상렬, e-mail : lsy@kist.re.kr, Tel:02-958-5382
주소: 서울시 성북구 하월곡동 한국과학기술연구원