THE 29TH KOREAN CONFERENCE ON SEMICONDUCTORS

제 29회 한국반도체학술대회

2022. 1. 24(월) - 26(수)

강원도 하이원 그랜드호텔(컨벤션타워) Online & Offline Hybrid

제 29회 한국반도체학술대회가 온/오프라인 하이브리드로 개최될 예정입니다. 제 29회 한국반도체학술대회 조직위원회와 사무국은 현장 참자가의 안전을 위해 코로나19 방역 지침에 따라 일자 별 현장 참석 인원을 선착순으로 제한합니다.

현장에 참여 예정이신 참가자께서는 참석 인원 초과 시, 숙소 등 행사장 이외의 공간에서 온라인으로 참석하실 수 있으니 본 학술대회가 안전하게 마무리 될 수 있도록 적극 협조 부탁 드립니다.
(** 방역 당국의 지침에 따라 변동 될 수 있습니다)

개회식 & 기조강연 유튜브 | 현장참가자 코로나19 대응지침

분과	포스터세션 LIVE CHAT 일정
A. Interconnect & Package	26일(수), 09:00-11:00
B. Patterning	26일(수), 09:00-11:00
C. Material Growth & Characterization	26일(수), 14:00-16:00
D. Thin Film Process Technology	25일(화), 09:00-11:00
E. Compound Semiconductors	25일(화), 16:00-18:00
F. Silicon and Group-IV Devices and Integration Technology	25일(화), 09:00-11:00
G. Device & Process Modeling, Simulation and Reliability	25일(화), 16:00-18:00
H. Display and Imaging Technologies	25일(화), 09:00-11:00
I. MEMS & Sensors Systems	25일(화), 16:00-18:00
J. Nano-Science & Technology	26일(수), 14:00-16:00
K. Memory (Design & Process Technology)	26일(수), 14:00-16:00
L. Analog Design	26일(수), 09:00-11:00
M. RF and Wireless Design	26일(수), 14:00-16:00
N. VLSI CAD	26일(수), 09:00-11:00
O. System LSI Design	26일(수), 09:00-11:00
P. Device for Energy (Solar Cell, Power Device, Battery, etc.)	26일(수), 09:00-11:00
Q. Metrology, Inspection, Analysis, and Yield Enhancement	26일(수), 15:30-17:30
R. Semiconductor Software	26일(수), 09:00-11:00
S. Chip Design Contest	
T. AI	26일(수), 09:00-11:00
U. Bio-Medical	26일(수), 14:00-16:00

2022년 1월 26일(수), 09:00-10:30

Room H (하트 I, 6층)

E. Compound Semiconductors 분과 [WH1-E]

Compound Semiconductor III

좌장: 김동현 박사(KANC)

WH1-E-1 **09:00-09:15**	**3-levels-stacked In0.53Ga0.47As MBCFETs with Regrown S/D Contacts** In-Geun Lee[1], Hyeon-Bhin Jo[1], Sang-Tae Lee[2], Minwoo Kong[4], Ji-Min Baek[1], Seung- Won Yun[1], Hyeon-Seok Jeong[1], Wan-Soo Park[1], Ji-Hoon Yoo[1], Su-Min Choi[1], SangKuk Kim[3], Jae-Gyu Kim[3], Jacob Yun[3], Ted Kim[3], Tae-Woo Kim[5], Dae-Hong Ko[6], JungHee Lee[1], Kwang-Seok Seo[4], Chan-Soo Shin[2], and Dae-Hyun Kim[1] [1]*Kyungpook National University,* [2]*Korea Advanced Nano Fab Center,* [3]*QSI Inc.,* [4]*Seoul National University,* [5]*University of Ulsan,* [6]*Yonsei University*
WH1-E-2 **09:15-09:30**	**Trap Behavior of Metamorphic HEMTs with Pulsed IV and 1/f Noise Measurements** Ki-Yong Shin[1], Ju-Won Shin[1], Walid Amir[1], Jae-Phil Shim[2], Sang-Tae Lee[2], Hyun-Chul Jang[2], Kyung-Ho Park[2], Chan-Soo Shin[2], and Tae-Woo Kim[1] [1]*School of Electrical, Electronic and Computer Engineering, University of Ulsan,* [2]*Korea Advanced Nano Fab Center*
WH1-E-3 **09:30-09:45**	**Microcavity-integrated Flexible Mid-infrared Photodetector with Hetero-epitaxial Growth** Seungwan Woo[1,2], Tae Soo Kim[3], Jae-Hoon Han[2], In-Hwan Lee[1], Eung-Beom Yeon[1,2], Daehwan Jung[2], and Won Jun Choi[2] [1]*Department of Materials Science and Engineering, Korea University,* [2]*Center for Optoelectronic Materials and Devices, KIST,* [3]*School of Electrical and Electronic Engineering, Yonsei University*
WH1-E-4 **09:45-10:00**	**Metal Contact Optimization of Quantum Dot Laser for Epitaxial Lift-Off** Sung-Han Jeon[1,2], Dae-Hwan Ahn[1], Jindong Song[1], Won Jun Choi[1], Woo-Young Choi[2], Daehwan Jung[1], and Jae-Hoon Han[1] [1]*Center for Opto-Electronic Materials and Devices, KIST,* [2]*Department of Electrical and Electronic Engineering, Yonsei University*
WH1-E-5 **10:00-10:15**	**Fabrication and Characterization of Normally-Off β-Ga_2O_3 Thin-Film Phototransistor with A Thickness of 8-nm** Youngbin Yoon[1], Youngki Kim[1], Wan Sik Hwang[2], and Myunghun Shin[1] [1]*School of Electronics and Information Engineering, Korea Aerospace University,* [2]*Department of Materials Engineering, Korea Aerospace University*
WH1-E-6 **10:15-10:30**	**Trap Analysis of AlGaN/GaN HEMT with Different Al Composition** Walid Amir[1], Ju-Won Shin[1], Ki-Yong Shin[1], Surajit Chakraborty[1], Jae-Moo Kim[2], ChuYoung Cho[2], Kyung-Ho Park[2], Takuya Hoshi[3], Takuya Tsutsumi[3], Hiroki Sugiyama[3], Hideaki Matsuzaki[3], and Tae-Woo Kim[1] [1]*Department of Electrical, Electronic and Computer Engineering, University of Ulsan,* [2]*Korea Advanced Nano Fab Center,* [3]*NTT Device Technology Laboratories, NTT Corporation*

Metal Contact Optimization of Quantum Dot Laser for Epitaxial Lift-Off

Sung-Han Jeon[1,2], Dae-Hwan Ahn[1], Jindong Song[1], Won Jun Choi[1], Woo-Young Choi[2], Daehwan Jung[1] & Jae-Hoon Han[1*]
[1]*Center for Opto-Electronic Materials and Devices, Korea Institute of Science and Technology (KIST),*
[2]*Department of Electrical and Electronic Engineering, Yonsei University, Korea*
*E-mail : hanjh@kist.re.kr

A quantum dots (QD) laser is a promising solution of on-chip light source for an integrated photonics platform thanks to its low threshold current density and high thermal stability [1]. To integrate high-performance QD lasers on Si, we have investigated the wafer bonding with epitaxial lift-off (ELO) technique on a Si platform (Fig. 1) [2]. In this report, we investigate metallization conditions for ELO wafer bonding with smooth surface morphology and low contact resistance. To confirm the contact resistance and the surface roughness, palladium (Pd), molybdenum (Mo), tungsten (W), and nickel (Ni) were deposited on a p+GaAs wafer and annealed for 1 minute. We confirmed that ohmic junction were not formed at the interfaces for Mo/p+GaAs and W/p+GaAs under the 250~400 °C temperature. In the case of Ni, although an ohmic condition was obtained after annealing over 300 °C, the root mean square (RMS) value for the surface roughness exceeded 1 nm; thus, it is not suitable for further wafer bonding process. Figure 2 shows the measured contact resistance and RMS surface roughness of Pd under various annealing temperatures for 1 min. Although the contact resistance decreased under higher annealing temperature, RMS values were degraded over 300 °C. Therefore, we chose the annealing temperature of 250 °C, which has relatively good contact resistance of 9.19 $\mu\Omega\cdot cm^2$ with a low RMS value of 0.563 nm. We also confirmed the wafer bonding process using Pd/Au bonding metal on QD-LD epitaxy substrate and p+Si substrate. Before bonding, a QD laser wafer was annealed for 1 min after Pd/Au deposition. Then, p+Si wafer and QD laser wafer were bonded at room temperature. Finally, QD laser structure was transferred on the Si substrate by ELO technique from the GaAs substrate using HF solution as shown in Fig. 3. This metallization condition is a promising solution for high-yield and low-resistivity wafer bonding with ELO technique for a QD laser on the Si platform.

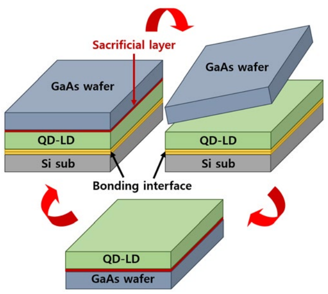

Fig 1. Schematics of wafer bonded QD laser on Si using metal bonding with ELO technique.

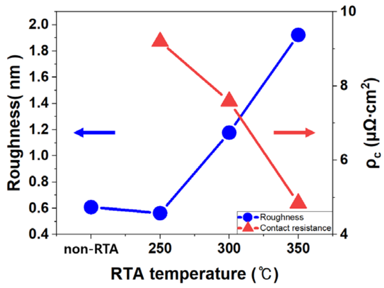

Fig 2 Contact resistance and RMS value of Au/Pd/p+GaAs after annealing.

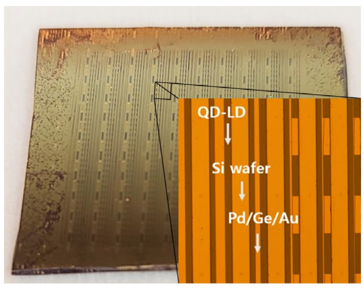

Fig 3. Image of wafer-bonded QD laser on Si using metal bonding with ELO technique.

Acknowledgments This work was supported in part by the Institutional Program (2E31011) funded by the Korea Institute of Science and Technology (KIST), and in part by the National Research Foundation of Korea (NRF) Grant funded by the Korean Government Ministry of Science and ICT under Grant 2017M1A2A2048904, 2019M3F3A1A0207206912

References [1] Kenichi Nishi *et al.,* "Development of Quantum Dot Lasers for Data-Com and Silicon Photonics Applications," *IEEE J. Sel. Top. Quantum Electron 23*, vol **1**, 2017. [2] Jae-Hoon Han, The 29th Korean Conference on Semiconductors (2021).