KOREA CMPUGM Korea Chemical Mechanical Planarization Users Group Meeting

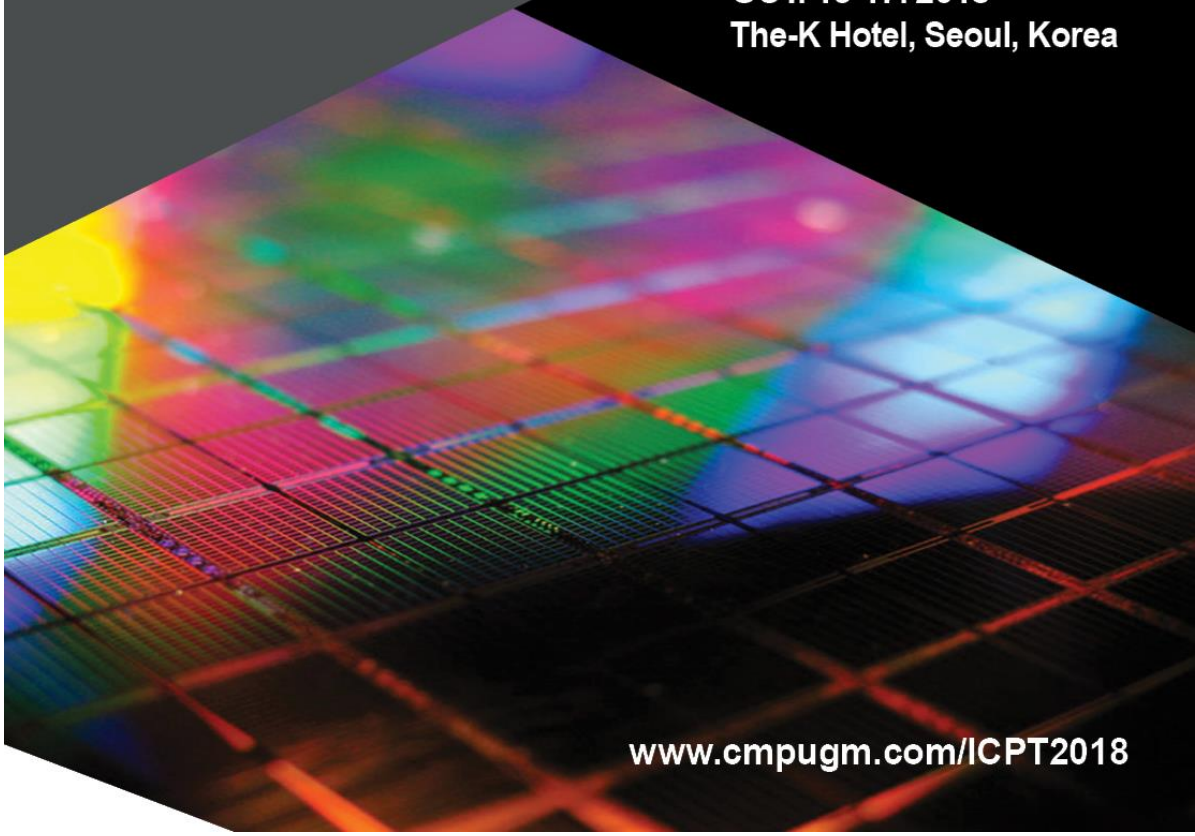
ICPT

Program Book

# ICPT 2018

International Conference on
Planarization/CMP Technologhy

OCT. 15-17. 2018
The-K Hotel, Seoul, Korea



www.cmpugm.com/ICPT2018

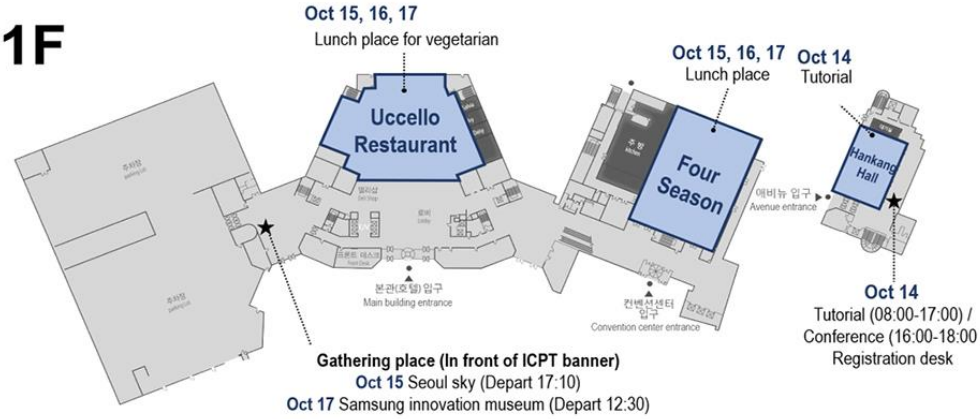
# Program

| Time | Sunday October 14 | Time | Monday October 15 | Time | Tuesday October 16 | Time | Wednesday October 17 |
|---|---|---|---|---|---|---|---|
| | | 7:00 | Registration (Geomungo Hall, 3F) | 7:00 | Registration (Geomungo Hall, 3F) | 7:00 | Registration (Geomungo Hall, 3F) |
| 8:00 | Tutorial Registration (Hankang Hall) | 8:00 | Opening Remark | 8:00 | Keynote lecture Dr. Hyunghwan Kim (SK Hynix) | 8:00 | Keynote lecture Dr. Manabu Tsujimura (Ebara) |
| 09:00 - 17:00 | Tutorial (Hankang Hall, 1F at Avenue) | 8:15 | Keynote lecture Dr. Boun Yoon (Samsung Electronics) | 8:40 | ICPT 2019 presentation (Taiwan CMPUG) | 8:40 | *Session I: CMP consumables |
| | | 8:55 | Session A: Process Control/BEOL | 8:55 | Session E: Equipment and metrology | | |
| | | 10:10 | Break & Exhibition | 10:10 | Break & Exhibition | 10:05 | Break & Exhibition |
| | | 10:30 | Session B: BEOL | 10:30 | *Session F: FEOL, Emerging technology | 10:25 | Session J: Defect, reliability issues and Post CMP cleaning |
| | | | | | | 11:40 | Student Award Sponsored by 3M Closing Remark |
| | | 11:45 | Versum Lunch & Exhibition | 11:55 | KCTech Lunch & Exhibition | 12:00 - 13:30 | Ebara Lunch |
| | | 13:00 | *Session C: CMP fundamentals, modeling and simulation | 13:00 | *Session G: CMP consumables | 12:30 - 16:00 | Optional Social Event (Samsung Innovation Museum) |
| | | 14:40 | Break & Exhibition | 14:40 | Break & Exhibition | | |
| | | 15:00 | *Session D: CMP fundamentals, modeling and simulation | 15:00 | Session H: Defect, reliability issues and Post CMP cleaning | | |
| 16:00 - 18:00 | Conference Registration (Hankang Hall) | 16:40 - 19:00 | AMAT Social Event (Seoul Sky) | 17:00 - 19:00 | Poster Session & Exhibition (Geomungo Hall, 3F) | | |
| | | 19:00 - 21:00 | Student Party (near Seoul Sky) | 19:00 - 21:00 | Levitronix Banquet (Gayageum Hall, 2F) | | |

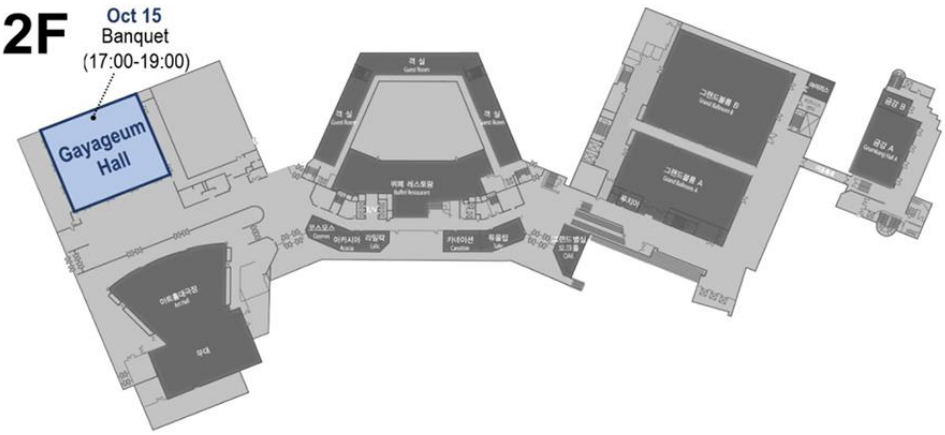
* : Invited paper is included in the session

# Floor Information

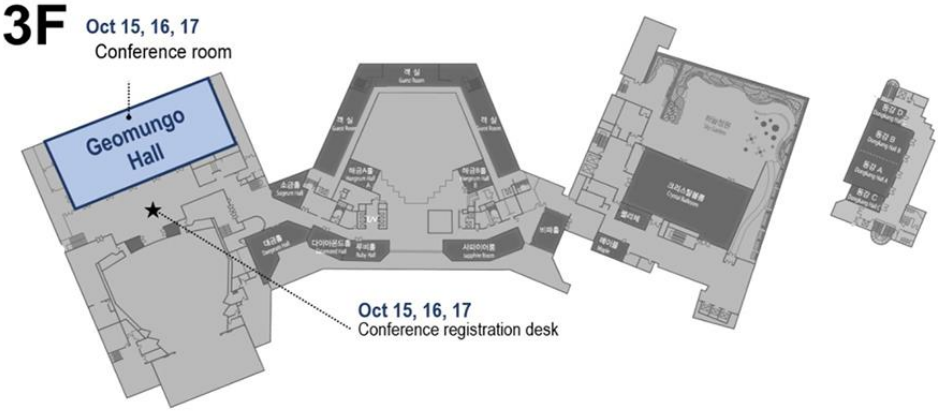
## 1F



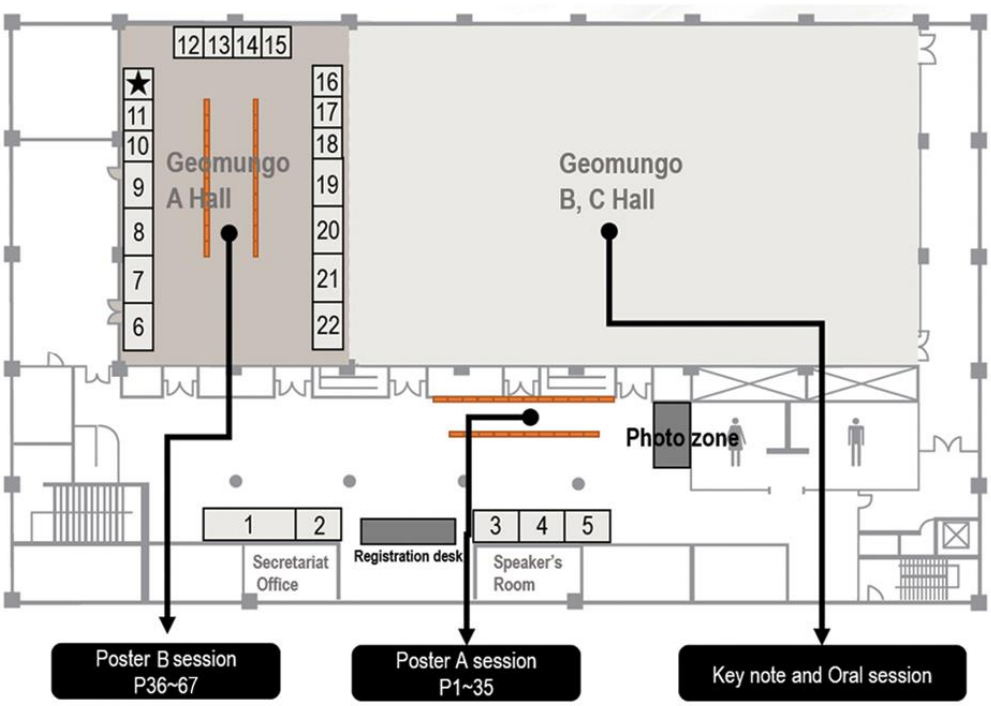

## 2F




## 3F



# Booth Layout




1 LEVITRONIX
2 EBARA
3 3M
4 VERSUM MATERIALS
5 KCTECH
6 ACE nanochem
7 K-PATENTS PROCESS INSTRUMENTS
8 ATIK
9 DOW
10 SHINHAN DIAMOND
11 Park SYSTEMS
12 BRUKER
13 Hitachi Chemical Working On Wonders
14 GaP TECHNOLOGY
15 HORIBA
16 SB TECH
17 BASF We create chemistry
18 SAESOL
19 NvisANA
20 FUJIFILM
21 Revasum
22 Entegris
★ Secretariat booth

# Contents



# I. Welcome Message

It is my great pleasure to host International Conference on Planarization/Chemical Mechanical Polishing (CMP) Technology (ICPT) 2018 in Seoul, Korea on behalf of Korea CMPUGM. As you all know, CMP has become one of the key process technologies in semiconductor fabrication. 3D/vertical structure and sub-10nm node cannot be possible without CMP. With the higher technical demand in semiconductor field and the expansion of its applied area in related industries, understanding the fundamentals of CMP is more important than ever, which is the main focus of ICPT.

ICPT is the one and only international conference in CMP field. It has been held every year organized by 6 CMP users group meeting from China, Europe, Japan, Korea, Taiwan and USA since 2005. We have a very close relationship and help each other based on friendship thanks to many pioneers in this field. This year, we received more than 130 abstracts and are expecting more than 400 attendees for the first time in ICPT history. This reflects the booming semiconductor industry and higher interest in CMP technology. I wish you would enjoy not only good presentations and discussions, but also unique culture and environment of Korea. Thank you for your participation, especially 24 sponsoring companies. Welcome to Korea!

Taesung Kim Conference Chair

# II. Organization

## Conference Chair

**Taesung Kim,** Sungkyunkwan University

## Program Chair

**Youngki Ahn,** Daelim University
**Kwangsu Kim,** Daelim University

## Local Organizing Committee

**Seungki Chae,** Sungkyunkwan University
**Hyeongjae Kim,** KITECH
**Wonhee Lee,** Dow Chemical
**Woowon Jeong,** Shinhan Diamond
**Changki Hong,** Versum Materials Korea
**Chanki Yang,** Ehwa Diamond
**Chieon Oh,** RTCK
**Youngjung Kim,** FUJIMI KOREA
**Jueyoung Lee,** EBARA
**Geonja Lim,** BASF
**Kwangho Oh,** Saesol Diamond
**Chuljin Park,** Ace Nanochem
**Byeongju Min,** KPX Chemical
**Jongwoo Kim,** SKC
**Jichul Yang,** SK Hynix
**Younjin Cho,** Samsung SDI
**Euihoon Jung,** KCTECH
**Sanghyeon Park,** 3M
**Hyeonseop Lee,** Dongmyung University
**Uirae Kim,** ECI Technology
**Heejun Yang,** Entegris

## International Executive Committee

### KOREA
Jin-Goo Park, Hanyang University
Haedo Jeong, Pusan National University

### CHINA
Xinchun Lu, Tsinghua University
Xinping Qu, Fudan University

### EUROPE
Gerfried Zwicker, Fraunhofer ISIT
Viorel Balan, CEA-LETI, France

### TAIWAN
Arthur Chen, National Taiwan University
Chris Chern, TSMC

### UNITED STATES
Ashwani K. Rawat, Intel
Rob Rhoades, Revasum

### JAPAN
Syuhei Kurokawa, Kyushu University
Yukiteru Matsui, Toshiba Memory Corporation

## International Program Committee

### KOREA
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Jonghan Shin, SK Hynix Semiconductor
Yungjun Kim, Samsung Electronics

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Baoguo Zhang, Hebei University of Technology
Weili Liu, Shanghai Xinanna Electronic Technology
Kun Li, Tianjin Hwatsing Technology

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Eric Jacquinot, Merck Performance Materials, France
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Cedric Perrot, STMicroelectronics, Crolles, France

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Kazumi Sugai, Fujimi Inc.
Norikazu Suzuki, Nagoya University
Yasuhisa Sano, Osaka University

### TAIWAN
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Tengchun Tsai, TSMC
Daniel Fang, National Taiwan University of Science and Technology
Jerry Hsu, National Taiwan University of Science and Technology

### UNITED STATES
S.V. Babu, Clarkson University
Mahadevaiyer Krishnan, IBM
Don Frye, Entegris
Andrew Carswell, Micron

# III. General Information

## Registration

**Oct. 14 (Sun)** *Place:* 1F, Hankang Hall

**Oct. 15~17 (Mon~Wed)** *Place:* 3F, Gemungo Hall

### Operating Hours

| Date | Oct 14 | Oct 15 | Oct 16 | Oct 17 |
|---|---|---|---|---|
| **Place** | Hankang Hall | Gemungo Hall | Gemungo Hall | Gemungo Hall |
| **Time** | 16:00~18:00 | 07:00~17:00 | 07:00~17:00 | 07:00~12:00 |

### Onsite Registration Fee

*Full rate:* US $700
*Student:* US $400

## Secretariat Office

*Place:* 3F, Violin behind registration desk

### Operating Hours

| Date | Oct 15 | Oct 16 | Oct 17 |
|---|---|---|---|
| **Time** | 07:00~17:00 | 07:00~17:00 | 07:00~12:00 |

## Wi-Fi Information

Free Wi-Fi is available

# Hotel Information

## The - K Hotel Seoul

*Address:* 70, Baumoe-ro 12-gil, Seocho-gu, Seoul
*TEL:* 82-2-571-8100


**Subway**
No. 9 Exit at Yangjae Station of Line 3 (Take the shuttle bus is front of Seocho-Culture & Arts Center)
No. 5 Exit at Yangjae Citizen's Forest Station of Sinbundang Line (5 minutes on foot)
* Line 2 Gangnam, Yangjae Station Sinbundang Line 3 Transit

**Bus**
General blue bus 405, 421, 140, 470, 441
No. 10 Exit at Yangjae Station of Line 3
Get off the bus at AT Center, Yangjae Flower Market (10 minutes on foot)
Take the Town bus (NO. 08) at Yangjae Station No. 11 Exit

**Trails**
Yangjae Citizens' Forest 0.5km (5 minutes)
Yangjaecheon 0.5 km (5 minutes)
Seocho Culture & Art Park 0.2km (3 minutes)

### Shuttle Schedule

| Time | Hotel - Yangjie Station | Yangjae Station - Hotel |
|---|---|---|
| 06:00 | 10, 30, 50 Min | 20, 40 Min |
| 07:00 ~ 08:00 | 10, 30, 50 Min | 00, 20 40 Min |
| 09:00 | 10, 40 Min | 00, 20, 50 Min |
| 10:00 ~ 22:00 | 10, 40 Min | 20, 50 Min |

## Airport bus

### 6500 Limousine Bus

**Board**

- Incheon Airport Terminal 1 airline: 1st floor 4B stop
- Incheon Airport Terminal 2 airline: first basement level Gate 15

*Get off*: Hotel (In front of Convention Center Building)
*Time of Travel*: Approx. 80 minutes

**[Costs (Fare)]**
- Adult ₩15,000
- Children ₩11,000(6~12old)

**Time interval**
- 300 minutes

**Airport Terminal 2 Airline**
- 09:55 / 15:00 / 20:10

**Airport Terminal 1 Airline**
- 10:15 / 15:20 / 20:30

**To Hotel**
- 07:00 / 12:00 / 20:25

### 6009 Limousine Bus

**Board**

- Incheon Airport 1st floor 4B, 11A stop

*Get off*: Yangjae Station Exit 5 (opposite of Hilstate Gallery)

**Time of Travel**
- Approx. 70 minutes

**[Costs (Fare)]**
- Adult ₩15,000
- Children ₩11,000(6~12old)

**Time interval**
- 15~25 minutes

**To Airport**
- 04:05 ~ 21:00

To the City
- 05:20 ~ 23:05

### Taxi

**Estimated Fare**
- 70,000~80,000 Won

**Time of Travel**
- Approx. 60 minutes

# Social Events

## Seoul sky

*Day:* Monday, 15 October 2018
*Time:* 16:40~19:00
*Price:* Included in registration
*Restaurants in Lotte Tower:* https://www.lwt.co.kr/en/department/shop/list.do
(Please notice AVENUEL section will be closed on Oct.15)

**From The-K Hotel to Seoul sky (by Bus)**

*Gathering place:* In front of ICPT banner, 1st floor (see the floor information page)
*Departure:* 17:10 at gathering place

**From Seoul sky to The-K Hotel (by Bus)**

*Gathering place:* Parking Space
*Departure:* 21:30 at gathering place

The Seoul Sky Observatory is located at the top of the Lotte World Tower, the world's fifth tallest building standing 123 stories and 555 meters high. As the tallest building in South Korea, it is the only place where you can take in a gorgeous 360-degree view of Seoul, the capital city of South Korea roaring with brilliant history and dynamic modern culture. The Observatory offers a diverse range of unique experiences that can only be had at a thrilling height of 500 meters in the air, including various exhibitions based on the theme "The Pride of Korea," a caf above the clouds, and exclusive tower-themed souvenirs. Visitors can see all of the different facets of Seoul Sky, ever-changing with the four seasons and time of day.

## Student party (near Seoul sky)

*Day:* Monday, 15 October 2018
*Time:* 19:00~21:00
*Price:* Included in registration
*Address:* 178-4 Bangi-dong, Songpa-gu, Seoul, KyoChon 1991 KyoChon Chicken

The purpose of student party is to encourage students from all over the world to meet and discuss about their research. and to just have fun!

* Student party will be held after the Seoul sky schedule, so you can use the same bus to travel back and forth.

## Samsung Innovation Museum (SIM)

*Day:* Wednesday, 17 October 2018
*Time:* 12:30 ~ 16:00
*Duration:* 3 hours
*Price:* USD $30 (Excluded in registration)

**From The-K Hotel to SIM (by Bus)**

Gathering place: In front of ICPT banner, 1st floor (see the floor plan)
Departure: 12:30 at gathering place

**From SIM to The K-Hotel (by Bus)**

*Arrival at The-K Hotel:* around 16:00

Lightbulbs light up the darkness, phones connect people, TVs and radios broadcast culture, and washing machines and refrigerators enrich our lives in various other ways. Electronics are essential parts of our everyday lives in modern society, and it is not exaggerating to say that electricity and electronics industry forms the backbone of our lives. Through innovations, from the discovery of electricity to the latest smartphones, the electronics industry has added a new value to our lives. Samsung Innovation Museum exhibits the history and the future of such innovations brought by the electronics industry. That is also why it is named Innovation Museum. Our lives have improved as great inventors and numerous electronics companies continued to introduce new technologies and products to the world through endless research and innovation. The invention of the radio and TV led to the development of mass media, and the communication and computing technologies revolutionized the generation, distribution and consumption of information. Like this, the electronics industry provides the foundation for the development of our civilization, and its history is a record of our challenge and desire for new value. In three Halls - Era of Inventors, Era of Corporate Innovation, and the Era of Creation - Samsung Innovation Museum shows not only the history of the electronics industry, but the achievements that Samsung Electronics has made in the IT industry with its leading semi-conductor, display and mobile technologies. At the end of the tour, we hope you understand our commitment to a prosperous future founded on the true meaning and value of innovation. We hope that Samsung Innovation Museum helps you learn about the history of the electronics industry and discover the meaning of innovation.

# IV. Conference Topics

| | |
|---|---|
| **[Session A]** | Process Control / BEOL |
| **[Session B]** | BEOL |
| **[Session C]** | CMP Fundamentals, Modeling, and Simulation |
| **[Session D]** | CMP Fundamentals, Modeling, and Simulation |
| **[Session E]** | Equipment and Metrology |
| **[Session F]** | FEOL, Emerging Technology |
| **[Session G]** | CMP Consumables |
| **[Session H]** | Defect, Reliability Issues and Post CMP Cleaning |
| **[Session I]** | CMP Consumables |
| **[Session J]** | Defect, Reliability Issues and Post CMP Cleaning |

# V. Instruction for Presentation

## Oral Presentation

### Presentation Time

* session times include 5 minutes-Q&A session at the end
- Key note presentation: 40min (35min for presentation, 5min for Q&A)
- Invited presentation: 25min (20min for presentation, 5min for Q&A)
- Oral presentation: 15min (10min for presentation, 5min for Q&A)

### Presentation Time

- Presentation file should be prepared in MS-PowerPoint or PDF formats in English
- Please bring your presentation file on USB memory stick and submit it to the staff of Speaker's room at least 20 minutes before each session starts.

### Audio Visual Equipment

All presenters are required to use only venue facilities. Session room will be equipped with the following facilities
- Laptop computer running MS-Office PowerPoint 2013 operated in Window 10 with USB drive
- Pointer and Mouse
- Beam projector

### No Camera & No Record

Photo taking and video recording are strictly prohibited in the presentation room

### Speakers Room

There will be a Speaker's Room provided for all speakers.
- The Speaker's Room is located on the Cello behind registration desk
- The following facilities will be provided in the room
  Lap top computers (operating system Windows 10, ) to review, alter and upload the presentations
- Operation hours

| Date | Oct 15 | Oct 16 | Oct 17 |
|---|---|---|---|
| **Time** | 07:00~17:00 | 07:00~17:00 | 07:00~12:00 |

## Poster Presentation


- Please put-up your poster Oct 15 and take-down Oct 17
- Poster should include the paper title, authors and affiliation
- Poster size must be a A0 (841mm*1189mm)
- Sticker posters will not be accepted under any circumstances
- You can only use tape that we provide to fix poster on the board (tape will be provided in secretary office)
- Please put your name card on during presentation
- Poster presenters are required to prepare their own poster materials

## Session Chair Guideline

- Please be present in your conference room at least 10 min. before the start of your session to introduce yourself to the speaker in your session
- At the begging of the session, please kindly;
  - Inform that photograph is not permitted to be taken within the conference room.
  - Q&A will be conducted for some minutes (5 min.) for each presentation
    After the presentation, please inform the participants that the questioner is to raise their hands for delivering the microphone
- Please use a bell to signal the remaining. The first ring means 5 minutes remaining for the talk and the second one means the end of the talk

# VI. Program Schedule

## Keynote Lecture

*Date/ Time:* Oct 15 (Mon)/ 08:15~08:55
*Place:* Geomungo B
*Session chair:* Prof. Jin-Goo, Park

### Challenges of CMP for the next generation devices

**Boun Yoon**
Master, Samsung Electronics

### Abstract

Since the CMP technology has been adopted as one of the semiconductor manufacturing processes, polishing target films have been made of a wider variety of materials to meet the various requirements for new devices. The development history of the CMP technology will be briefly reviewed focusing on materials, and the next generation CMP technologies will also be covered with their limitations and challenges.

In the early days of the CMP, silicon oxide was the only material of a target film. In these days, however, target films may be made of poly Si, SiN and SiC as well as the silicon oxide. The removal rate of each film can be controlled using slurries composed of advanced abrasive particles and various functional additives.

The metal CMP, which is required to form the wire and contact hole pattern through a damascene process, has been developed to polish W, Al, and Cu. Recently, Co and Ru are strongly recommended as promising new metal materials because of their low electrical resistance.

In these metal CMPs, the removal rate should be controlled while suppressing corrosion and dishing. New challenges arise with the coming era of emerging devices such as PRAM and CIS, which require new material CMP technologies, e.g. GST, ITO and organic-CMP. Various applications of Cu CMP, e.g. Cu-to-Cu bonding and Cu in TSV and RDL, which are considered as a new process, also have many technical limitations. All these CMP needs well-designed technology with tools and chemical consumables. Technical challenges of CMP for the next generation devices will be treated in this presentation.

## Biography

Bo Un Yoon is Master of Samsung Electronics. He has more than 22 years experience in the CMP area. He joined semiconductor R&D center of Samsung Electronics, Hwasung, Korea in 1996. His career is focused on developing the next generation process, materials and equipment of CMP for DRAM, Flash and Logic devices. He has published more than 40 papers in technical journals and conferences and holds over 120 US. patents. He is a member of program committee of ICPT since 2011. He received the B.S., M.S. and Ph.D. degrees in chemistry from the Seoul National University, Seoul, Korea, in 1988, 1990, and 1996, respectively.

*Date/ Time:* Oct 16 (Tue)/ 08:00~08:40
*Place:* Geomungo B
*Session chair:* Prof. Haedo Jeong

### CMP Process as a key Enable for Developing Semiconductor ; Past, Present, Future

**Hyunghwan Kim**
Vice President, SK Hynix

## Abstract

It is a well-known fact that the remarkable development of the IT industry in recent years is largely driven by the semiconductor industry. In this presentation, I will take a look at the contribution of CMP to the development of the semiconductor industry, focusing on memory semiconductor. CMP has played a role as a breakthrough, an enabler, a hard worker, and a key player in the memory semiconductor industry as well as the system IC. And, For smaller scaling down, higher stacking up and more stable HVM which are needed to go further, I will talk about what kind of CMP technology to cope with this situation and what is needed in the future

## Biography

Dr. HyungHwan Kim is Vice President of SK hynix Inc., who has been worked at SK hynix since 1999. He received a Dr. degree in Engineering field from Seoul National University. He has contributed to academies and associations such as; Researcher of Research Institute of Advanced Materials (Korea). Member of Korea Chemical Mechanical Planarization Users Group Meeting (Korea), Member of Korea Surface Cleaning Users Group Meeting (Korea), A Panel Member of Korea Semiconductor Industry Association (Korea). He has more than 60 patents and has written more than 10 papers.

*Date/ Time:* Oct 17 (Wed)/ 08:00~08:40
*Place:* Geomungo B
*Session chair:* Prof. Taesung Kim

## New CMP Innovation to Open New Paradigm

**Manabu Tsujimura**
Chief Executive Officer, Ebara Corporation

## Abstract

The history of miniaturization of semiconductors, which has been supported by Dennard's theory and developed in accordance with Moore's law, has entered the new era of Å, and the market is expected to grow explosively beyond the conventional market mechanisms. Semiconductor technology has always faced developing technical challenges, each of which has been overcome by a newly proposed innovation. Even now, a sense of stagnation about the future technology is pervasive. On the other hand, the market is expected to grow explosively due to a shift from single driver technology, including PCs and mobile phones, to multi-driver technology including ICAC5 (IoT, cloud, AI, cars, and 5G). This paper covers a method of development through Enhanced Open Innovation, which is an advanced form of Open Innovation, as a method for overcoming the sense of stagnation about the future technology and responding to the explosively growing market. In preparation for the paradigm revolution of semiconductors that is expected to occur in 2030, CMP needs to be advanced in terms of hardware as well as software. Manabu's principle "Semiconductor device technology is immortal as long as there are human desires" is about to be proved.

## Biography

Dr. Manabu Tsujimura is CTO of Ebara Corporation, who has been worked at Ebara Corporation since 1974 and was a president of Precision Machinery Company from 2011 to 2015. He received a Dr. degree in Engineering field from Tokyo Metropolitan University. He is Fellow of JSME (The Japan Society of Mechanical Engineerings). He has contributed to academies and associations such as; Visiting Professor of Clarkson University (USA), Hanyang University (Korea), Sungkyunkwan University (Korea), National Taiwan University of Science and Technology (Taiwan), Fudan University (China). Chair of SEAJ (Semiconductor Equipment Association of Japan), Vice chair of JVIA (Japan Vacuum Industry Association). He has more than 100 patents and has written more than 100 papers.

# Opening Remarks

*Chair* : Prof. Taesung Kim

08:00~08:15

# Oral Sessions

## Keynote Lecture I

*Session Chair* : Prof. Jin-Goo Park

08:15~08:55 K1 **Challenges of CMP for the next generation devices**
Boun Yoon
Master, Samsung Electronics

## Session A: Process Control/BEOL

*Session Chair* : Prof. Arthur Chen
Prof. Baoguo Zhang

08:55~09:10 A1 **Effect of Chemical and Mechanical Polishing on Photolithography Key: Key Design, Slurry, Stack, CMP Variables, Rotation and Asymmetry**
Kyungho Hwang, Hongjoo Lee, Hyunghwan Kim, Myungkyu Ahn, and Seungho Pyi
SK Hynix

09:10~09:25 A2 **Effects of Test Patterns Upon Edge-Over-Erosion (EOE) Evaluations During W and Cu CMP Processes**
SooKap Hahn
SKW Associates

09:25~09:40 A3 **Adaptive Endpoint Application on 200mm CMP Oxide Process**
Leonardo Caudo and Cosimo Patini
STMicroelectronics

09:40~09:55 A4 **The Behaviors of basic Alkaline Slurry with or without oxidant during the CMP of TSV Backside Heterogeneous Microstructure**
Bingquan Wang, Yuhong Liu, Jie Cheng, Ruiheng Yan, and Xinchun Lu
Tsinghua Univ.

09:55~10:10 A5 **Nanocatalyst Induced Hydroxyl Radical (·OH) for Removal of Tungsten (W) in Chemical Mechanical Polishing**
Maneesh Kumar Poddar, Heon-Yul Ryu, Yeon-Ah Jeong, Jung-Hwan Lee, Jaehyun Kim, Jong-Dai Park, Mingun Lee, Chang-Yong Park, Seongjun Han, Myeong-Jun Kim and Jin-Goo Park
Hanyang Univ., Dongjin Semichem

10:10~10:30 *Break & Exhibition*

## Session B: BEOL

*Session Chair* : Dr. Gerfried Zwicker
Dr. Yungjun Kim

10:30~10:45 B1 **Addressing Galvanic Corrosion Issues During Co CMP**
Ming-Shih Tsai, Steven Chiang, Xiaobo Shi, Iain Buchanan, Rung-Je Yang, Anupama Mallikarjunan, Chris Li, Mark O'Neill
Versum Materials

10:45~11:00 B2 **Effect of Glycine on the CMP of Ru in Alkaline NaClO Based Slurry**
Shuai Shao, Peng He, Bingbing Wu and Xin-Ping Qu
Fudan Univ.

11:00~11:15 B3 **Study on the Mechanism of Defect Reduction during Copper Barrier Chemical mechanical planarization**
Yuling Liu, Chenwei Wang, Baoguo Zhang
Hebei Univ., Tianjin Key Laboratory of Electronic Materials and Devices

11:15~11:30 B4 **Higher Removal Selectivity of Ruthenium to Copper by using Guanidine Carbonate in H2O2 based Slurry**
Qingwei Wang, Jianwei Zhou, Chenwei Wang, and Yuling Liu
Hebei Univ.

11:30~11:45 B5 **Total Solution of Metal CMP**
Te-Yu Wei, Michael Lauter, Haci Osman Guevenc
BASF

11:45 ~ 13:00 ***Versum Lunch (Four Season at Convention Center 1F)***

## Session C: CMP Fundamentals

*Session Chair* : Prof. Xinchun Lu
Prof. Michio Uneda

13:00~13:25 C1 **(Invited) Advances in CMP Fomulations Technology**
O'Neill, Mark L.
Versum Materials

13:25~13:40 C2 **The Pasivation Stability of Corrosion Inhibitors on the Surface of Cobalt for Sub 10 nm Device Application**
Muthukrishnan Purushothaman, Heon-Yul Ruy, Samrina Sahir, Jung-Hwan Lee, Yutaka Wada, Satomi Hamada, Hirokuni Hiyama, and Jin-Goo Park
Hanyang Univ., Ebara

13:40~13:55 C3 **Digital Transformation (DT) in the Advanced Semiconductor Manufacturing Process**
Yongsik Moon, Moonhwan Lee, Hyunghwan Kim, and Seungho Pyi
SK Hynix

13:55~14:10 C4 **CMP Process Modeling and Full Stack CMP simulations for Sub 14 nm Technology**
Ushasree Katakamsetty, Yongfu Li, Ernesto Gene de la Garza, Dewei Xu, Lili Cheng, Emiko Motoyama, Sam Nakagawa, Ruben Ghulghazaryan, Jeff Wilson, Simon Favre, Marawan Nabil
GLOBALFOUNDRIES, Mentor A Siemens Business

14:10~14:25 C5 **Study on Mechanism of High Material Removal in Sapphire-CMP with sub 10-nm silica particles using Evanescent field Light**
Natthaphon Bun-Athuek, Panart Khajornrungruang, and Keisuke Suzuki
Kyushu Institute of Technology

14:25~14:40 C6 **The Impact of the Pad Surface Temperature Control on W CMP Performance**
Gael Royere, Lieve Teugels, Ban Ito, Takeshi Iizumi, Fabien Durix, Katia Devriendt, Patrick Ong, and Herbert Struyf
imec, EBARA

14:40~15:00 *Break & Exhibition*

## Session D: CMP Fundamentals

*Session Chair* : Dr. Ashwani K Rawat
Dr. Patrick Ong

15:00~15:25 D1 **(Invited) A CMP History of Tomorrow**
Jichul Yang
SK Hynix

15:25~15:40 D2 **Cerium Valence Change of Nanoceria in Oxide Polishing**
Satoyuki Nomura and Tasuku Onodera
Hitachi Chemical, Hitachi

15:40~15:55 D3 **Why Did the Wafer Slip? Deduction of Wafer Attitude Data from Force Data**
L. Borucki, Y. Sampurno, and A. Philipossian
Araca

15:55~16:10 D4 **Full Chip Neural Network-Based Deposition Models for CMP Modeling: Challenges and Perspectives**
Ruben Ghulghazaryan, Milena Hovhannisyan, and Jeff Wilson
Mentor Graphics Development Services, Mentor A Siemens Business

16:10~16:25 D5 **Examining the Relationship between Silica Particle Behavior and CMP Defects**
Allison Hsu, Mia Wu, James Lee, Henry Wang, Steven Hsiao, and Bob Shie
Entegris

16:25~16:40 D6 **Development of Pressure Simulation and Check of Consistency for Study of Wafer Edge CMP Profile Characteristics**
Yang-Hee Lee, Su-Young Shin, Choong-Seob Shin, Hyo-Jin Oh, Myeng-Jae Jang, Young-Ho Koh, Jong-Hyuk Park, Il-Young Yoon, Bo-Un Yoon, Kyoung-Seob Shin, Byeong-jun park, Da-sol Lee, and Hae-do Jeong
Samsung Electronics, Pusan National Univ.

Tuesday, Oct. 16, 2018 / Geomungo Hall (3F)

07:00 *Conference Registration (Geomungo Hall)*

## Keynote Lecture II

*Session Chair* : Prof. Haedo Jeong

08:00~08:40 K2 **CMP Process as a key Enable for Developing Semiconductor ; Past, Present, Future**
Hyunghwan Kim
Vice President, SK Hynix

## ICPT 2019 Presentation (Taiwan CMPUG)

08:40~08:55

## Session E: Equipment and Metrology

*Session Chair* : Prof. Syuhei Kurokawa
Dr. Eric Jacquinot

08:55~09:10 E1 **Analysis of Leakage Characteristics for CMP Slurries using GOI Pattern Wafer**
Jongyoung Cho, Changji Han and Hyungsoon Park
SK Hynix

09:10~09:25 E2 **A New Method for Determining the Size Distribution of Particles in CMP Slurries**
By Steven Kosier and David Blackford
Kanomax FMT

09:25~09:40 E3 **Visualizing Slurry Flow in CMP using High-Speed Videography**
Leticia Vazquez Bengochea, Yasa Sampurno, Calliandra Stuffle, Fransisca Sudargho, Ruochen Han, Chris Rogers, and Ara Philipossian
Univ. of Arizona, Araca, Tufts Univ.

09:40~09:55 E4 **Holographic characterization of agglomerates in CMP slurries**
Fook Chiong Cheong, Priya Kasimbeg, Annemarie Winters, Jaroslaw M. Blusewicz, Ei-Hnin Hlaing, David B. Ruffner, Robin V. Ihnfeldt, David G. Grier, and Laura A. Philips
Spheryx, General Engineering and Research, New York Univ.

09:55~10:10 E5 **In-Line Refractive Index In Assay Characterization Of Incoming Fresh and Effluent Spent CMP Slurry**
Jason Kiernan, Leticia V zquez Bengochea, Robert Johnston, and Marcus Kavaljer
GLOBALFOUNDRIES, Univ. of Arizona, Yarbrough Solutions Worldwide, K-Pantents

10:10~10:30 *Break & Exhibition*

## Session F: FEOL / Emerging Technology

*Session Chair* : Dr. Viorel Balan
Dr. Kyungho Hwang

10:30~10:55 F1 **(Invited) Controlling CMP Performance via Precise Control of Microreplicated Pad Asperities**
Alexander Simpson, Jaimie Stomberg, David Muradian, Chris Loesch,
Uma Rames Krishna Lagudu, Duy LeHuu, Larry Zazzera, Vince Laraia, Don Kim, and Gyujin Jung
3M

11:10~11:25 F2 **Effect of dressing conditions on CMP pad surface deformation**
Pei-Jiun Ricky Shiu, Tzu-Hao Li, Ze-Yuan Wang, Hirokuni Hiyama, Yutaka Wada,
Chao-Chang Arthur Chen, Keiichi Kimura
EBARA, National Taiwan Univ. of Science and Technology, Nano Art Project

11:25~11:40 F3 **Design and Development of Bidirectional Electrode in Electro-Kinetic Force Assisted Chemical Mechanical Planarization for Through-Glass-via Wafer Planarization**
Chao-Chang A.Chen, Li-Sin Lu, Yu-Ming Lin , Shang-Ju Kuo, and Shang-Fong Chiu
National Taiwan Univ. of Science and Technology, National Quemoy Univ.

11:40~11:55 F4 **CMP for SiC Substrate Manufacturing and Backside Thinning**
Robert L. Rhoades
Revasum

11:55 ~ 13:00 *KCTech Lunch (Four Season at Convention Center 1F)*

## Session G: CMP Consumables

*Session Chair* : Prof. Xinping Qu
Prof. Norikazu Suzuki

13:00~13:25 G1 **(Invited) Role of CMP Pads in Active Process Monitoring**
Rajeev Bajaj, Gregory Menk, Daniel Redfield, Ashwin Chockalingam, Mario Cornejo,
and Fritz Redeker
Applied Materials

13:25~13:40 G2 **Managing STI CMP Performances through Pad Microstructure Control Using Disruptive Technology**
Viorel Balan, Catherine Euvrard, Chloe Martin-Cocher, Jessica Lassare, Nicolas Daventure,
Rajeev Bajaj, Daniel Redfield, Aniruddh Khanna
CEA-LETI, Applied Materials

13:40~13:55 G3 **Tuning CMP Performance via Precise Control of Microreplicated Pad Conditioner Features**
Alexander Simpson, Uma Ramesh Krishna Lagudu Chris Loesch, Matt Fritz, Junqing Xie,
James Burke, Jim Starkey, Mark Ellefson, and Larry Zazzera
3M

13:55~14:10 G4 **Effect of Conditioner Type and Downforce, and Pad Surface Micro-Texture, on the Tribological, Thermal and Kinetic Attributes of SiO2 CMP**
Jeffrey McAllister, Calliandra Stuffle, Yasa Sampurno, Dale Hetherington, Jon Sierra Suarez,
Leonard Borucki, and Ara Philipossian
Univ. of Arizona, Araca, Sandia National Lab.

14:10~14:25 G5 **Investigation of $CeO_2$ Based Slurry Process Stability using 3D Pad Surface Characterization**
C dric Perrot, Mathilde Catherin, Jessica Lassarre, Catherine Euvrard, and Viorel Balan
STMicroelectronics, CEA-LETI

14:25~14:40 G6 **Tunable Abrasives for CMP**
Francois Batllo and Yulia Tataurova
Nalco Water

14:40~15:00 *Break & Exhibition*

## Session H: Defect and Post CMP Cleaning

*Session Chair* : Dr. Cedric Perrot
Dr. Kazumi Sugai

15:00~15:15 H1 **Brush Induced Tribo-corrosion Mechanism on the Tungsten Void Defect at Post CMP Cleaning**
Hong Jin Kim, Bryan Egan, and Ja-Hyung Han
GLOBALFOUNDRIES

15:15~15:30 H2 **Next Generation CMP Filtration Strategy Targeted Toward Defect Reduction**
John Morby, Robert Gieger, and Majid Entezarian
3M

15:30~15:45 H3 **Development of Copper Post-CMP cleaner resolving convex defect with post-etch residues removal capability**
Ping Hsu ,Cooper Wu, Ruby Chen, and Fred Huang
EKC Technology

15:45~16:00 H4 **Post-CMP Co Cleaners with Out-performing Co Compatibility and Cleaning Performance**
Jean Yang, Ping Hsu, Max Tsai, Ruby Chen, Chuan-An Kao, and Chi Yen
EKC Technology

16:00~16:15 H5 **Proposal of Nano-particle Cleaning Phenomenon Observation Method on Silicon Nitride Surface by Evanescent Field**
Yutaka Terayama, Panart Khajornrungruang, Asato Nakano, Satomi Hamada, Yutaka Wada, and Hirokuni Hiyama
Kyushu Institute of Technology, EBARA

16:15~16:30 H6 **Liquid Replacement Characteristic nea the Wafer Surface in Post CMP Cleaning Process**
Naoyuki Handa, Satomi Hamada, Yutaka Wada, Hirokuni Hiyama, Ayako Yano, and Kenji Amagai
EBARA, Gunma Univ.

16:30~16:45 H7 **On-Product Metrology at High Resolution Over Full Wafer — Applications for CMP & Fin Process Development**
Shifang Li, Andrew Cross, Diana Tsvetanova and Herbert Struyf
KLA-Tencor, IMEC

16:45~17:00 H8 **A Systematical Approach to Cu Recess Generation Mechanism during Cu Post CMP Cleaning**
Sangyoon Lee, Sukbae Joo, Yunjin Kim, Eunkyoung Kim, Jaeseok Kim, Ja Eung Koo, and Bo Un Yoon
Samsung Electronics

17:00 ~ 19:00 *POSTER Session & Exhibition (Geomungo Hall A (3F))*

19:00 ~ 21:00 *Levitronix Banquet (Gayageum Hall (2F))*

*Wednesday, Oct. 17, 2018 / Geomungo Hall (3F)*

7:00 *Conference Registration (Geomungo Hall)*

## Keynote Lecture III

*Session Chair* : Prof. Taesung Kim

08:00~08:40 K3 **Enhanced Open Innovation**
**- New CMP Innovation to Open New Paradigm -**
Manabu Tsujimura
Chief Executive Officer, EBARA

## Session I: CMP Consumables

*Session Chair* : Dr. Hirokuni Hiyama
Dr. Knut Gottfried

08:40~09:05 I1 **(Invited) CMP Materials Supply Chain Challenges in 10 nm and Beyond**
Ashwani Rawat, Mark Buehler
Intel

09:05~09:20 I2 **Effect of Slurry Preparation in Facilities Systems on CMP Process Performance**
Rahul Trivedi, Caesar Buie, Jason Kiernan, Thayalan Kulasingam, Hong Jin Kim, Tae Hoon Lee, and Carlo Aparece
GLOBALFOUNDRIES

09:20~09:35 I3 **Colloidal Ceria Slurries for 10 nm and beyond: Challenges and Solutions**
Jun Ha Hwang, Jung Yoon Kim, Sung Pyo Lee, Eui Hoon Jung
KCTech

09:35~09:50 I4 **Development of a cleaning slurry for post CMP process**
Shogo Oonishi, Tsutomu Yoshino, Yasuto Ishida, and Kazumi Sugai
Fujimi

09:50~10:05 I5 **CMP Process Integration and Defect Control for Sub 10nm Node**
David P. Huang
Pall

10:05~10:25 *Break & Exhibition*

## Session J: Defect and Post CMP Cleaning

*Session Chair* : Dr. Yukiteru Matsui
Dr. Rob Rhoades

10:25~10:40 J1 **Enhancement of Particle Removal Efficiency Using Non-Contact Cleaning technology in Post Metal CMP**
Seungjun Lee, Ki Ho Bae, Kyungtae Lee, Seunghoon Choi, Chae Lyoung Kim, Yung Jun Kim, Hoyoung Kim, KwangWook Lee and Bo Un Yoon
Samsung Electronics

10:40~10:55 J2 **Post-CMP Cleaning of Ceria Particles from Silicon Dioxide and Nitride Wafers for Advanced Technology Nodes**
Jihoon Seo, Akshay Gowda, and S.V. Babu
Clarkson Univ.

10:55~11:10 J3 **Classification and Quantification of CMP Defects Under Silica and Ceria Abrasives**
Gwangwon Lee, Sangsoo Kim, Jeongbeom Seo and Gyuhyun Kim
SK Hynix

11:10~11:25 J4 **Role of Slurry Bubble Formation on the Generation of Defects during W CMP Process**
Yeon-Ah Jeong, Heon-Yul Ryu, Jung-Hwan Lee, Maneesh Kumar Poddar, Nagendra Prasad Yerriboina, Jaehyun Kim, Jong-Dai Park, Mingun Lee, Chang-Yong Park, Seongjun Han, Myeong-Jun Kim and Jin-Goo Park
Hanyang Univ., Dongjin Semichem

11:25~11:40 J5 **A Post-CMP Cleaning Challenge on Memory Manufacturing**
Hojoong Kim, Minjoo Choo, Dongwoo Lee, Byungjoon Cho and Youngju Shin
Samsung Electronics

## Closing Remarks & Student Award 11:40~12:00

*Chair* : Prof. Taesung Kim

12:00 ~ 13:30 ***Ebara Lunch***

# Poster Session

P1 **Effects of Controlled Pad Temperature on Removal Rate in Cu CMP Process**
Jinhyung Lee, Seong Sik Kim, Kyung-ho Hwang, Yongsik Moon, Moonhwan Lee, and Hyunghwan Kim
SK Hynix

P2 **Fundamental Improvement of Cleaning Performance Using CMP Equipment Sequence Analysis**
YoungSang Kim, MyoungShik Kim, SungHo Kim, SeungMahn Lee, and Jeong Nam Han
Samsung

P3 **Optimization of CVD Process for CVD Conditioner with Improved Performance**
Yeo-Ho Kim, Heon-Yul Ryu, Jung-Hwan Lee, Yu-Jin Lee, Ji-Woo Kim, Dabin Hyun, Jisu Lee and Jin-Goo Park
Hanyang Univ., Saesol Diamond

P4 **A study on the correlation between defect and Zeta-potential of CMP Pad**
Jeongbeom Seo, Hyoungryeun Kim, and Sungmin Hwang
SK Hynix

P5 **Study on the Micro-defect Reduction during Si Final Polishing**
Yangang He
Hebei Univ. of Technology

P6 **A Method for Size Distribution Measurement of Sub-100 nm Colloidal Silica Nanoparticles** and its Application to CMP Slurry
Cheolmin Shin, Donggeon kwak, Seungki Chae, Yinhua Jin and Taesung Kim
Sungkyunkwan University

P7 **Analysis on Pad Performance for Selectivity of Oxide and Nitride CMP**
Chao-Chang Arthur Chen, Shih-Yao Wang, Min-Hsun Chang, Bai-Cheng Xiao, I-Peng Yao, Yung-Chang Hung, Kuo-Wei Huang
National Taiwan Univ. of Science and Technology, Bestac Advanced Material Corporation

P8 **Study on Buckminsterfullerene (C60) Slurry in Electro-Kinetic Force Chemical Mechanical Planarization for Cu CMP**
Chao-Chang A. Chen, Keisuke Suzuki, Yueh-Hsun Tsai, Wei-Chin W. Pu, Shang-Fong Chiu, Xin-Jie Huang
National Taiwan Univ. of Science and Tech-nology, Kyushu Institute of Technology

P9 **Effects of Amino Acids for High Silicon Oxide Removal Rate**
Donggeon Kwak, Cheolmin shin ,Vinit K. Kanade and Taesung Kim
Sungkyunkwan University

P10 **Structure-Property Relationships between polyurethane design of Pad and CMP performance**
Jaein Ahn, Jong Wook Yoon, Hye Young Heo, Gyu An Jin, Jae Gon Choi and Sang Hwa Lee
SKC Co., ltd, Skhynix

P11 **Measurement of viscoelasticity of polishing pad and utilization in FEA**
Byeongjun Pak, Hyunjin Kim, Seonho Jeong, Kihun Lee and Haedo Jeong
Pusan National University

P12 **Mathematical modeling based on contact mode between pad asperity and oxide pattern during CMP**
Hyunjin Kim, Byeongjun Pak, Seonho Jeong, Dasol Lee, and Haedo Jeong
Pusan National University

P13 **Improvement in prediction accuracy of polishing pressure distribution in CMP process**
Yohei Hashimoto, Norikazu Suzuki, Hozumi Yasuda, Satoru Yamaki, and Yoshihiro Mochizuki
Kanazawa University, Nagoya University, Ebara Corporation

P14 **High Performance CMP of Oxide Film by Controlling Aggregation State of Colloidal Ceria Slurry**
Syuhei Kurokawa, Takaaki Toyama, Terutake Hayashi, Eisaku Suda, and Jun Tokuda
Kyushu University, Solvay Special Chem Japan, Ltd.

P15 **Study on Effects of Crossing Direction of Dressing on CMP Pads by Single Grit Diamond Tools**
Chao-Chang Arthur Chen, Tzu-Hao Li, Jen-chieh Li, Ze Yuan Wang, Hirokuni Hiyama, Yutaka Wada, Pei-Jiun Ricky Shiu, Keiichi Kimura
National Taiwan University of Science and Technology, Ebara Corporation

P16 **The Effect of CMP Process on Wafer Residual Stress**
Bocheng Jiang, Yan Chen, Alex Fang, Yuhong Liu, Hong Liang and Xinchun Lu
Tsinghua University, Texas A&M University

P17 **A Novel Method to Evaluate the Catalyst Effect on the Performance of W CMP Process**
Yeon-Ah Jeong, Heon-Yul Ryu, Jung-Hwan Lee, Maneesh Kumar Poddar, Nagendra Prasad Yerriboina, Jaehyun Kim, Jong-Dai Park, Mingun Lee, Chang-Yong Park, Seongjun Han, Myeong-Jun Kim and Jin-Goo Park
Hanyang University ERICA, Dongjin Semichem Co. Ltd.

P18 **In-situ Measurement of Cu-Inhibitor Complex Layer by AFM**
Heon-Yul Ryu, Samrina Sahir, Kwang-Min Han, Jun-Kil Hwang, Yutaka Wada, Satomi Hamada, Hirokuni Hiyama, Tae-Gon Kim, and Jin-Goo Park
Hanyang University ERICA, EBARA Corporation, imec

P19 **Stability of Cu CMP Process: Critical Abrasive Concentration**
Yen Tao Tseng, Peng Hsin Wang, Ming Che Ho, Ming Hui Lu
UWiZ Technology Co., Ltd.

P20 **High-Efficiency Method for CMP of SiC using Enhanced Slurry Containing Nanobubbles with Active Gas**
Koji Fujii, Michio Uneda, Kazutaka Shibuya, Yoshio Nakamura, Daizo Ichikawa and Ken-ichi Ishikawa
Kanazawa Institute of Technology, Fujikoshi Machinery Corp.

P21 **Dynamic behavior analysis of magnetic clusters for three-dimensional magnetic assisted polishing**
Ryoichi Shiyama, Michio Uneda, Kazutoshi Hotta, Kazusei Tamai, Hitoshi Morinaga and Ken-ichi Ishikawa
Kanazawa Institute of Technology, FUJIMI INCORPORATED

P22 **Observation of dynamical behavior of slurry particles under DC electric field and its evaluation**
Masanori Fujimoto and Michio Uneda
Kanazawa Institute of Technology

P23 **New Advance Simulator Applied to Analyze the Short Circuit in Cu CMP Architectures**
Li-Ping Huang, Ming-Hsiang Chen, Shih-Hsi Chen, Shih-Ci Yen, Chiao-Wei Liu, I-Hsin Chen1, Shih-Hao Huang
Powerchip Technology Corporation, Coventor, Inc.

P24 **Prediction of Pad Profile during Conditioning Process in Chemical Mechanical Polishing**
Eungchul Kim, Chul Kang, Jichul Yang, Yinhua Jin, and Taesung Kim
Sungkyunkwan University, SK hynix

P25 **Effects of Pattern Structures Arrangement during Copper Chemical Mechanical Polishing**
Lixiao Wu, Sookap Hahn, Changfeng Yan
Lanzhou University of Technology, SKW Associates₩

P26 **Influence of different additive on r-plane sapphire substrate CMP removal rate**
Xinhuan Niu, Yaqi Cui, Kai Zhang, Jiakai Zhou and Ru Wang
Hebei University of Technology

P27 **Post-CMP W Cleaners with Excellent Tungsten Residues and Titanium Residues Removal**
Shih-Hsun Lin, Zoey Chiang, Max Tsai, Fred Huang, Ian Hung, and Chi Yen
EKC Technology

P28 **The Last Puzzle toward Cost-Effective CMP Processing: New-generation PCMP Cleaner for Positive-charged Silica Slurry**
Jhih-Fong Lin, Paul Bernatis, Stacy Dai, Lucy Bai, Eric Lee, Ling Chang, Akira Kuroda and Chi Yen
EKC Technology, Dupont

P29 **Polysilicon PostCMP Cleaning: Material Solution beyond the Emerging Technical Hurdle in FEOL Processing**
Jhih-Fong Lin, Paul Bernatis, Stacy Dai, Lucy Bai, Eric Lee, Ling Chang, Akira Kuroda and Chi Yen
EKC Technology, Dupont

P30 **Particle removal by liquid flow for effective wafer cleaning**
Satomi Hamada, Naoyuki Handa, Yutaka Wada
EBARA Corporation

P31 **Investigation of Abrasive Behavior during Water Polishing**
Seokjun Hong, Juhwan Kim, Vinit K. Kanade, Taesung Kim, Wada Yutaka, Hiyama Hirokuni and Satomi Hamada
Sungkyunkwan University, Ebara Corp.

P32 **Development of Pre-cleaning Process for Cu Flake Reduction in Post CMP Cleaning**
Taeyoung Kwon, Byeongwook Lee, Jungrae Kim, Jiyong Lee, Dongkeun Kim, Youngtak Noh, Myoungshik Kim, Sangheon Oh, Seungmahn Lee, Hyunki Kim, and Jeongnam Han
Samsung Electronics Co.

P33 **Investigation of Abrasive Removal during Post Chemical Mechanical Polishing Cleaning**
Juhwan Kim, Seokjun Hong, Vinit K. Kanade and Taesung Kim
Sungkyunkwan University

P34 **Evaluation Method of the Approach of Nanoparticles-to-Surface in CMP using Optical Evanescent Field**
Thitipat Permpatdechakul, Yutaka Terayama, Panart Khajornrungruang, Keisuke Suzuki, Natthaphon Bun-Athuek
Kyushu Institute of Technology

P35 **Study on Passivation and Planarization Characteristics Based on Copper in Weakly Alkaline Polishing Slurry**
Shengli Wang, Qiyuan Tian, and Shengjun Tian
Hebei University of Technology

P36 **Adhesion and Removal Behavior of Contaminants from Polyvinyl Acetal(PVA) Brush during Post CMP Cleaning Process**
Jung-Hwan Lee, Jun-Kil Hwang, Muthukrishnan Purushothaman, Yu-Jin Lee, Satomi Hamada, Yutaka Wada, Hirokuni Hiyama, and Jin-Goo Park
Hanyang University ERICA, EBARA Corporation

P37 **Investigation of cleaning processes after Tungsten-CMP₩**
Andreas Kr ger, Andreas Trusch, Marco Lisker
IHP

P38 DEVELOPMENT OF POST CMP CLEANING SOLUTIONS FROM COPPER TO COBALT COMPATIBILITY IMPROVEMENT AND WITH LOW DEFECTIVITY PERFORMANCE
Yi-Han Yang, Che-Yu Kuo, Cheng-Chun Huang, Ming-Che Ho and Ming-Hui Lu
UWiZ Technology Co., Ltd.

P39 Surface Properties of PVA Brush with AFM High-resolution Imaging
Shohei Shima, Satomi Hamada, Chikako Takatoh, Yutaka Wada, Akira Fukunaga, and Hiroshi Sobukawa
Ebara Corporation

P40 Flow Pattern Observation of Upper and Lower Surface Cleaning on otating Wafer
Ayako Yano, Ryota Koshino, Kenji Amagai, Hirokuni Hiyama, Yutaka Wada, Akira Fukunaga,
Shohei Shima, Masayoshi Imai, Satomi Hamada, and Naoyuki Handa
Gunma University, Ebara Corporation

P41 Optimization conditions of cleaning solution based on tetramethylammonium hydroxide for post-CMP cleaning on silicon wafer
Lifei Zhang, Tongqing Wang, Xinchun Lu
Tsinghua University

P42 Scratch Defect Reduction during Copper Barrier CMP by using a kind of Dispersant Agent
Chenwei Wang, Jiacheng Qi, Yuling Liu , Baoguo Zhang
Hebei University of Technology

P43 Integration of Cu B/S process for a Void Free 2Xnm node Technology
Kuo-Tzu Peng , Yi-Wen Lu , Shih-His Chen , Hung-Ju Chien , Ming-Chen Lu , Chang-Che Chen,
Wei-Lin Wang , Pei-Chia Chen , Shi-Jun Liu
Powerchip Technology Corporation

P44 Temperature effects on torques generated by a rotating PVA brush
Keishi Yamada, Toshiyuki Sanada, Akira Fukunaga and Hirokuni Hiyama
Shizuoka Univ., Ebara Corp.

P45 Electrochemical Study of GaN in Different Aqueous Oxidant Solutions
Li Zhang, Baoguo Zhang, Xuan Yu, Chenwei Wang, Yuling Liu
Hebei University of Technology

P46 Analysis on Abnormal Oxidation of Sole Contact in Tungsten CMP
Yohan Jeon, Kyungho Hwang, Hyunghwan Kim, Myungkyu Ahn, and Seungho Pyi
SK Hynix Semiconductor Inc.

P47 Applications of AFM and 3D Microscope on Metrology in CMP
Fan Yen Lin, Yueteng Wei, Wanxin Sun
Bruker Nano Surface

P48 Real Time Process Monitoring in CMP, Post CMP Clean Blending and Distribution Applications
Ji, Younseog, Karl Urquhart, Robert Johnston, Pat Swayze and Marcus Kavaljer
SB TECH Corporation, Diversified Fluid Solutions, Yarbrough Solutions Worldwide, K-Patent

P49 A Novel Technique for In-Situ Observation of Local Polishing Efficiency by Utilizing Infrared Thermography
Norikazu Suzuki, Hirotaka Misono, Eiji Shamoto, Shintaro Goto, Hozumi Yasuda, and Yoshihiro Mochizuki
Nagoya University, Ebara Corporation

P50 **Quantitative and Qualitative Kinetic Analysis of Single, Double and Triple Slurry Components for Cu CMP**
Samrina Sahir, Kwang-Min Han, Heon-Yul Ryu, Muthukrishnan Purushothaman,Youn Hee Nam, Keun Sam Jang, Taewon Park and Jin-Goo Park
Hanyang University, Samsung SDI

P51 **Low Selective Tungsten Slurry without Transitional Metal as Catalyst**
Yun-Lung Ho, Ming-Che Ho, Ming-Hui Lu
UWiZ Technology Co., Ltd.

P52 **Comparison of Silica- and Ceria-Slurry for Direct STI-CMP**
Andreas Kr ger, Andreas Trusch, Marco Liske
IHP

P53 **Design of a high removal rate slurry for Poly-Si films**
Yohei Takahashi, Yukinobu Yoshizaki, Yasuto Ishida, and Kazumi Sugai
FUJIMI

P54 **Study on Polishing Characteristics of Silica Slurry for CMP Process**
Yunsun Choi, Hyeongsoon Park
SK Hynix

P55 **Controllability of temperature profile by slurry mist system during Cu CMP**
Dasol Lee, Hyunseop Lee, Hyunjin Kim, Byeongjun Pak, and Haedo Jeong
Pusan National Univ.

P56 **CMP EDGE REMOVAL PROFILE IMPROVEMENT WITH RETAINER RING CONDITION CHANGE**
Jonghwa Baek, Hyunghwan Kim, and Seungho Pyi
SK Hynix

P57 **New Improvements for 200mm legacy CMP tools for in-situ control of polish uniformity to enable production worthy thick Cu CMP**
Ayse Karagoz, Patrick Ong, Andrew Cockburn, and Jamie Leighton
Applied Material Europe, Applied Material USA

P58 **The Preparation and Characterization of Self-Made Cerium Oxide Particles Used in STI CMP**
Lile Xie, Tongqing Wang, and Xinchun Lu
Tsinghua Univ.

P59 **Tool Matching Improvement on Tantalum CMP**
Franck LASCOR, Emmanuel LEMAIRE, Olivier LATINIER, Laurianne DENIS
X-FAB France

P60 **Research on In-Situ Thickness Measurement for Copper Chemical Mechanical Planarization Process**
Hongkai Li, Xinchun Lu, and Jianbin Luo
Tsinghua Univ.

P61 **Profile Scanning System Based on Optical Endpoint Detection in Cu CMP Process**
Fangxin Tian, Yu Yao, Kai Cui, Jun Ge and Xinchun Lu
Tsinghua Univ., Semiconductor Manufacturing International Corporation

P62 **Effect of Chemical Mechanical Polishing Process on Remove Rate and Selectivity of Cobalt and Copper**
Pan Guofeng, Huang Chao, Ji Jun, He Ping, Qi Jiacheng,Wang Chenwei
Hebei Univ.

P63 **Improve Topography With ILD CMP Process**
Ming-Hsiang Chen, Shih-Hsi Chen, Shih-Ci Yen, I-Hsin Chen, Li-Ping Huang, Chiao-Wei Liu, Shao-Yu Hsu
Powerchip Technology Corporation

P64 **CMP Characteristics of Copper Pillar and Polymer layer in Package Substrate**
Seonho Jeong, Dasol Lee, Hyunjin Kim, Byeongjun Pak and Haedo Jeong
Pusan National University

P65 **Process Stabilization of Acidic Ceria Slurry through Pad Wear Control**
Sanghyeok Lee, Jichul Yang, and Sanghwa Lee
SK hynix

P66 **COPPER CMP SLURRIES FOR ADVANCED NODE APPLICATIONS**
Tom Shi, Mark O'Neill, Chris Li, Ming-Shih Tsai, Rung-Je Yang, Scott Chang
Versum Materials

P67 **Topography Improvement through Chemical Enhancement of a Cu-Barrier CMP Slurry**
Lu Gan, James A. Schlueter, James A. Schlueter, Brian Lee, Yi Ching Wu , Jie Sun and Yu Jen Chiu
Versum Materials