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Ph. D. Materials Science and Engineering



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Research Keywords: Gas sensors; photo sensors; taste sensors; metal oxide nano-architectures; energy materials

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### **PERSONAL**

Nationality : Republic of Korea (Born 21 May 1986)

### **EDUCATION AND EXPERIENCE**

- 2019 – present : **Assistant professor.** Division of Advanced Materials Engineering, Chonbuk National University  
Smart Sensors and Energy-materials Laboratory (SSEL)
- 2018 – 2019 : **PostDoc.** Department of Materials Science and Engineering, Korea University  
Advisor: Prof. Jong-Heun Lee  
Research project: Breath-marker selective nano-chemiresistors
- 2017 – 2018 : **Research Associate.** Department of Mechanical and Process Engineering, ETH Zürich  
Project Investigator: Prof. Sotiris E. Pratsinis  
Research project: A hand-held breath NH<sub>3</sub> analyzer for routine screening of kidney dysfunction
- 2011 – 2017 : **Integrated Ph. D.** in Dept. of Materials Science and Engineering, Korea University  
Supervisor: Prof. Jong-Heun Lee  
Thesis: Design of high performance oxide semiconductor gas sensors using multi-modal porosity, micro-reactors, and regenerative sensing surface
- 2005 – 2011 : **B. S.** in Dept. of Materials Science and Engineering, Korea University

### **HONORS AND AWARDS**

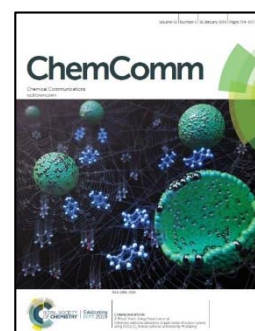
- Nov. 2011 : Best Poster Presentation Award; 9<sup>th</sup> ACCS in Taiwan
- Nov. 2013 : The Best Paper Award; Korea Sensor Society in Korea
- Feb. 2014 : Best Paper Award; BK21 Plus Program in Korea
- Apr. 2014 : Participation Prize for Research Topic Presentation; Korea Ceramic Society in Korea
- Aug. 2015 : Best Paper Award; Korea University in Korea
- Nov. 2015 : Best Presenter Award; 11<sup>th</sup> ACCS in Malaysia
- Jan. 2016 : Best Paper Award; BK21 Plus Program in Korea
- Mar. 2016 : Press Release; Ministry of Science and ICT (MSIT) in Korea
- Aug. 2016 : Best Paper Award; Korea University in Korea

Publications (h-index: 20)		Patents				Conferences			
SCI Journal	Domestic Journal	International		Domestic		International		Domestic	
		Regis.	Appl.	Regis.	Appl.	Invited	Oral	Invited	Oral
<b>29</b>	6	<b>2</b>	<b>13</b>	<b>9</b>	11	0	7	1	6

### **PUBLICATIONS (Total SCI Articles: 29)**

#### ■ 1<sup>st</sup> AUTHOR: 14

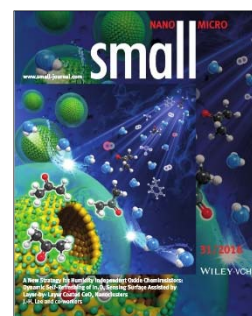
1. K. Lim, Y.-M. Jo, J.-W. Yoon\*, J.-H. Lee\*, *J. Mater. Chem. A* **2019**, 7, 24919-24928.  
“Metal oxide patterns of one-dimensional nanofibers: on-demand, direct-write fabrication, and application as a novel platform for gas detection”
2. K. H. Lee, B.-Y. Kim, **J.-W. Yoon\***, J.-H. Lee\*, *Chem. Commun.* **2019**, 55, 751-754. – **Cover Picture Article**  
“Extremely selective detection of ppb levels of indoor xylene using CoCr<sub>2</sub>O<sub>4</sub> hollow spheres activated by Pt doping”
3. B.-Y. Kim, J.-W. Yoon, K. Lim, S. H. Park, **J.-W. Yoon\***, J.-H. Lee\*, *J. Mater. Chem. C* **2018**, 6, 10767-10774.  
“Hollow spheres of CoCr<sub>2</sub>O<sub>4</sub>-Cr<sub>2</sub>O<sub>3</sub> mixed oxides with nanoscale heterojunctions for exclusive detection of indoor xylene”
4. B.-Y. Kim<sup>†</sup>, **J.-W. Yoon\***, J. K. Kim, Y. C. Kang, J.-H. Lee\*, *ACS Appl. Mater. Interfaces* **2018**, 10, 16605-16612.  
“Dual role of multi-room structure in Sn-doped NiO microspheres for ultrasensitive and highly selective detection of xylene” – [†] Equal contribution



5. **J.-W. Yoon**, J.-H. Lee\*, *Lab Chip* **2017**, *17*, 3529-3726. – **Invited Review Article, Inside Cover Picture Article**  
“Toward breath analysis on a chip for disease diagnosis using semiconductor-based chemiresistors: Recent progress and future perspectives”
6. **J.-W. Yoon**, J.-S. Kim, T.-H. Kim, Y. J. Hong, Y. C. Kang, J.-H. Lee\*, *Small* **2016**, *12*, 4229-4240. – **Cover Picture Article**  
“A new strategy for humidity independent oxide chemiresistors: Dynamic self-refreshing of In<sub>2</sub>O<sub>3</sub> sensing surface assisted by layer-by-layer coated CeO<sub>2</sub> nanoclusters”
7. **J.-W. Yoon**<sup>+</sup>, S. H. Choi<sup>+</sup>, J.-S. Kim, H. W. Jang, Y. C. Kang\*, J.-H. Lee\*, *NPG Asia Mater.* **2016**, *8*, e244. – [<sup>+</sup>] Equal contribution – **Press Release**  
“Trimodally porous SnO<sub>2</sub> nanospheres with three-dimensional interconnectivity and size tunability: A one-pot synthetic route and potential application as an extremely sensitive ethanol detector”
8. **J.-W. Yoon**, Y. J. Hong, G. D. Park, S.-J. Hwang, F. Abdel-Hady, A. A. Wazzan, Y. C. Kang, J.-H. Lee\*, *ACS Appl. Mater. Interfaces* **2015**, *7*, 7717-7723.  
“Kilogram-scale synthesis of Pd-loaded quintuple-shelled Co<sub>3</sub>O<sub>4</sub> microreactors and their application to ultrasensitive and ultrasensitive detection of methylbenzenes”
9. **J.-W. Yoon**, J. H. Yoon, J.-H. Lee\*, C. S. Hwang\*, *Nanoscale* **2014**, *6*, 6668-6678.  
“Impedance spectroscopic analysis on effects of partial oxidation of TiN bottom electrode and microstructure of amorphous and crystalline HfO<sub>2</sub> thin films on their bipolar resistive switching”
10. Y. J. Hong<sup>+</sup>, **J.-W. Yoon**<sup>+</sup>, J.-H. Lee\*, Y. C. Kang\*, *Chem. Eur. –J.* **2014**, *20*, 2737-2741. – **Citations: 62**, [<sup>+</sup>] Equal contribution  
“One-pot synthesis of Pd-loaded SnO<sub>2</sub> yolk-shell nanostructures for ultrasensitive methylbenzene sensors”
11. **J.-W. Yoon**, H.-J. Kim, H.-M. Jeong, J.-H. Lee\*, *Sens. Actuators, B* **2014**, *202*, 263-271.  
“Gas sensing characteristics of p-type Cr<sub>2</sub>O<sub>3</sub> and Co<sub>3</sub>O<sub>4</sub> nanofibers depending on inter-particle connectivity”
12. **J.-W. Yoon**<sup>+</sup>, Y. J. Hong<sup>+</sup>, Y. C. Kang\*, J.-H. Lee\*, *RSC Adv.* **2014**, *4*, 16067-16074. – [<sup>+</sup>] Equal contribution  
“High performance chemiresistive H<sub>2</sub>S sensors using Ag-loaded SnO<sub>2</sub> yolk-shell nanostructures”
13. **J.-W. Yoon**, H.-J. Kim, I.-D. Kim, J.-H. Lee\*, *Nanotechnology* **2013**, *24*, 444005. – **Citations: 60**  
“Electronic sensitization of the response to C<sub>2</sub>H<sub>5</sub>OH of p-type NiO nanofibers by Fe doping”
14. **J.-W. Yoon**, J.-K. Choi, J.-H. Lee\*, *Sens. Actuators, B* **2012**, *161*, 570-577. – **Citations: 109**  
“Design of a highly sensitive and selective C<sub>2</sub>H<sub>5</sub>OH sensor using p-type Co<sub>3</sub>O<sub>4</sub> nanofibers”

■ **CO-AUTHOR: 15**

1. S.-Y. Jeong, **J.-W. Yoon**, T.-H. Kim, H.-M. Jeong, C.-S. Lee, Y. C. Kang, J.-H. Lee\*, *J. Mater. Chem. A* **2017**, *5*, 1446-1454. – **Cover Picture Article**  
“Ultra-selective detection of sub-ppm-level benzene using Pd-SnO<sub>2</sub> yolk-shell micro-reactors with a catalytic Co<sub>3</sub>O<sub>4</sub> overlayer for monitoring air quality”
2. T.-H. Kim, **J.-W. Yoon**, Y. C. Kang, F. Abdel-Hady, A. A. Wazzan, J.-H. Lee\*, *Sens. Actuators, B* **2017**, *240*, 1049-1057.  
“A strategy for ultrasensitive and selective detection of methylamine using p-type Cr<sub>2</sub>O<sub>3</sub>: Morphological design of sensing materials, control of charge carrier concentrations, and configurational tuning of Au catalysts”
3. P. Rai, **J.-W. Yoon**, C.-H. Kwak, J.-H. Lee\*, *J. Mater. Chem. A* **2016**, *4*, 264-269.  
“Role of Pd nanoparticles in gas sensing behavior of Pd@In<sub>2</sub>O<sub>3</sub> yolk-shell nanoreactors”
4. J.-S. Kim, **J.-W. Yoon**, Y. J. Hong, Y. C. Kang, F. Abdel-Hady, A. A. Wazzan, J.-H. Lee\*, *Sens. Actuators, B* **2016**, *229*, 561-569.  
“Highly sensitive and selective detection of ppb-level NO<sub>2</sub> using multi-shelled WO<sub>3</sub> yolk-shell spheres”
5. P. Rai, **J.-W. Yoon**, H.-M. Jeong, S.-J. Hwang, C.-H. Kwak, J.-H. Lee\*, *Nanoscale* **2014**, *6*, 8292-8299. – **Citations: 102**  
“Design of highly sensitive and selective Au@NiO yolk-shell nanoreactors for gas sensor applications”
6. Y. J. Hong, **J.-W. Yoon**, J.-H. Lee, Y. C. Kang\*, *Chem. Eur. –J.* **2014**, *21*, 371-376.  
“A new concept for obtaining SnO<sub>2</sub> fiber-in-tube nanostructures with superior electrochemical properties”
7. H.-J. Kim, **J.-W. Yoon**, K.-I. Choi, H. W. Jang, A. Umar, J.-H. Lee\*, *Nanoscale* **2013**, *5*, 7066-7073. – **Citations: 144**  
“Ultrasensitive and sensitive detection of xylene and toluene for monitoring indoor air pollution using Cr-doped NiO hierarchical nanostructures”



8. B.-Y. Kim, J. H. Ahn, **J.-W. Yoon**, C.-S. Lee, Y. C. Kang, F. Abdel-Hady, A. A. Wazzan, J.-H. Lee\*, **ACS Appl. Mater. Interfaces** **2016**, *8*, 34603-34611.  
“Highly selective xylene sensor based on NiO/NiMoO<sub>4</sub> nanocomposite hierarchical spheres for indoor air monitoring”
9. B.-Y. Kim, J. S. Cho, **J.-W. Yoon**, C. W. Na, C.-S. Lee, J. H. Ahn, Y. C. Kang\*, J.-H. Lee\*, **Sens. Actuators, B** **2016**, *234*, 353-360.  
“Extremely sensitive ethanol sensor using Pt-doped SnO<sub>2</sub> hollow nanospheres prepared by Kikendall diffusion”
10. S.-J. Hwang, K.-I. Choi, **J.-W. Yoon**, Y. C. Kang, J.-H. Lee\*, **Chem. Eur. –J.** **2015**, *21*, 5872-5878.  
“Pure and palladium-loaded Co<sub>3</sub>O<sub>4</sub> hollow hierarchical nanostructures with giant and ultrasensitive chemiresistivity to xylene and toluene”
11. X. Liang, T.-H. Kim, **J.-W. Yoon**, C.-H. Kwak, J.-H. Lee\*, **Sens. Actuators, B** **2015**, *209*, 934-942.  
“Ultrasensitive and ultrasensitive detection of H<sub>2</sub>S using electrospun CuO-loaded In<sub>2</sub>O<sub>3</sub> nanofiber sensors assisted by pulse heating” – **Citations: 63**
12. H.-M. Jeong, H.-J. Kim, P. Rai, **J.-W. Yoon**, J.-H. Lee\*, **Sens. Actuators, B** **2014**, *201*, 482-489. – **Citations: 52**  
“Cr-doped Co<sub>3</sub>O<sub>4</sub> nanorods as chemiresistor for ultrasensitive monitoring of methyl benzene”
13. H.-Y. Li, J.-W. Yoon, C.-S. Lee, K. Lim, **J.-W. Yoon**, J.-H. Lee\*, **Sens. Actuators, B** **2018**, *255*, 2963-2970.  
“Visible light assisted NO<sub>2</sub> sensing at room temperature by CdS nanoflake array”
14. H.-Y. Li, L. Huang, X.-C. Wang, C.-S. Lee, **J.-W. Yoon**, J.-H. Lee\*, **RSC Adv.** **2017**, *7*, 3680-3685.  
“Molybdenum trioxide nanopaper as a dual gas sensor for detecting trimethylamine and hydrogen sulfide”
15. Z. Dai, C.-S. Lee, B.-Y. Kim, C.-H. Kwak, **J.-W. Yoon**, H.-M. Jeong, J.-H. Lee\*, **ACS Appl. Mater. Interfaces** **2014**, *6*, 16217-16226. – **Citations: 66**  
“Honeycomb-like periodic porous LaFeO<sub>3</sub> thin film chemiresistors with enhanced gas-sensing performance”

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## **PATENTS**

### **▪ REGISTRATIONS\_DOMESTIC: 9**

1. J.-H. Lee, S.-Y. Jeong, T.-H. Kim, **J.-W. Yoon**, K. H. Ahn, G. S. Chung, **10-1813226**, 21<sup>th</sup> Dec. 2017  
“Benzene gas sensors using catalytic overlayer structured oxide semiconductors and fabrication method thereof”
2. J.-H. Lee, B.-Y. Kim, **J.-W. Yoon**, **10-1806742**, 1<sup>st</sup> Dec. 2017.  
“*p*-xylene sensors using NiO/NiMoO<sub>4</sub> nano composites and fabrication method thereof”
3. J.-H. Lee, H.-M. Jeong, **J.-W. Yoon**, J.-S. Kim, J.-H. Kim, **10-1764478**, 27<sup>th</sup> Jul. 2017.  
“Composite for detecting ethanol comprising In<sub>2</sub>O<sub>3</sub> hollow spheres and Au catalyst, method for preparing the same and ethanol sensor including the same”
4. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, Y. J. Hong, **10-1616173**, 21<sup>th</sup> Apr. 2016.  
“Methyl benzene sensors using Pd-loaded SnO<sub>2</sub> yolk-shell spheres and fabrication method thereof”
5. J.-H. Lee, **J.-W. Yoon**, J.-S. Kim, **10-1594734**, 5<sup>th</sup> Feb. 2016.  
“Composite for detecting gas comprising In<sub>2</sub>O<sub>3</sub> hollow spheres and CeO<sub>2</sub> nanoparticles, method for preparing the same and gas sensor including the same”
6. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S. H. Choi, **10-1588169**, 18<sup>th</sup> Jan. 2016.  
“Porous oxide semiconductor comprising nanopores, mesopores and macropores interconnected each other in three dimension, method for preparing the same and gas sensor including the same as a gas sensing”
7. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S.-J. Hwang, **10-1550356**, 31<sup>th</sup> Aug. 2015.  
“Methyl benzene sensors using Pd-loaded Co<sub>3</sub>O<sub>4</sub> nano-structures and fabrication method thereof”
8. J.-H. Lee, H.-J. Kim, **J.-W. Yoon**, **10-1491819**, 3<sup>rd</sup> Feb. 2015.  
“Methyl benzene sensors using Cr-doped nickel oxide nano-structures and fabrication method thereof”
9. J.-H. Lee, H.-J. Kim, **J.-W. Yoon**, **10-1457374**, 28<sup>th</sup> Oct. 2014.  
“C<sub>2</sub>H<sub>5</sub>OH gas sensor using Fe-doped nickel oxide nano-structures and fabrication method thereof”

### **▪ REGISTRATION (2) & APPLICATIONS (13)\_INTERNATIONAL: 15**

1. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S.-J. Hwang, **E.P.O patent 3260855**, 13<sup>th</sup> Nov. 2019
2. J.-H. Lee, H.-J. Kim, **J.-W. Yoon**, **US patent 9671382B2**, 6<sup>th</sup> Jun. 2017  
“C<sub>2</sub>H<sub>5</sub>OH gas sensor using Fe-doped nickel oxide nano-structures and fabrication method thereof”
3. J.-H. Lee, B.-Y. Kim, **J.-W. Yoon**, K.-H. Lee, **US/16/718,659**, 18<sup>th</sup> Dec. 2019  
“CoCr<sub>2</sub>O<sub>4</sub>-based gas sensor and method for manufacturing the same”
4. J.-H. Lee, **J.-W. Yoon**, J.-S. Kim, **US/15/751.679**, 9<sup>th</sup> Feb. 2018  
“Composite for highly reliable gas detection without influence of moisture, methods for preparing the

- composite, gas sensor including the composite and method for fabricating the gas sensor”
5. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S. H. Choi, **US/15/747,689**, 25<sup>th</sup> Jan. 2018  
“Porous oxide semiconductor including three-dimensionally interconnected nanopores, mesopores, and macropores, method for preparing the porous oxide semiconductor and gas sensor including the porous oxide semiconductor as gas sensing material”
  6. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S. H. Choi, **CN/201680043676.6**, 25<sup>th</sup> Jan. 2018  
“Porous oxide semiconductor including three-dimensionally interconnected nanopores, mesopores, and macropores, method for preparing the porous oxide semiconductor and gas sensor including the porous oxide semiconductor as gas sensing material”
  7. J.-H. Lee, S.-Y. Jeong, T.-H. Kim, **J.-W. Yoon**, K. H. Ahn, G. S. Chung, **PCT/KR2017/013271**, 21<sup>th</sup> Nov. 2017  
“Benzene gas sensors using catalytic overlayer structured oxide semiconductors and fabrication method thereof”
  8. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S.-J. Hwang, **US/15/551,484**, 16<sup>th</sup> Aug. 2017  
“Methylbenzene gas sensor using palladium-containing cobalt oxide nanostructures and method for manufacturing the same”
  9. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S.-J. Hwang, **EP/15882778.2**, 16<sup>th</sup> Aug. 2017  
“Methylbenzene gas sensor using palladium-containing cobalt oxide nanostructures and method for manufacturing the same”
  10. J.-H. Lee, **J.-W. Yoon**, J.-S. Kim, **PCT/KR2016/008770**, 10<sup>th</sup> Aug. 2016.  
“Composite for detecting gas comprising In<sub>2</sub>O<sub>3</sub> hollow spheres and CeO<sub>2</sub> nanoparticles, method for preparing the same and gas sensor including the same”
  11. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S. H. Choi, **PCT/KR2016/006997**, 30<sup>th</sup> Jun. 2016.  
“Porous oxide semiconductor comprising nanopores, mesopores and macropores interconnected each other in three dimension, method for preparing the same and gas sensor including the same as a gas sensing”
  12. J.-H. Lee, H.-J. Kim, **J.-W. Yoon**, **U.S.A/14/646,939**, 22<sup>th</sup> May 2015.  
“C<sub>2</sub>H<sub>5</sub>OH gas sensor using Fe-doped nickel oxide nano-structures and fabrication method thereof”
  13. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S.-J. Hwang, **PCT/KR2015/004765**, 12<sup>th</sup> May 2015.  
“Methyl benzene sensors using Pd-loaded Co<sub>3</sub>O<sub>4</sub> nano-structures and fabrication method thereof”
  14. J.-H. Lee, H.-J. Kim, **J.-W. Yoon**, **E.P.O/14785541.5**, 8<sup>th</sup> May 2015.  
“C<sub>2</sub>H<sub>5</sub>OH gas sensor using Fe-doped nickel oxide nano-structures and fabrication method thereof”
  15. J.-H. Lee, H.-J. Kim, **J.-W. Yoon**, **PCT/KR2014/002011**, 11<sup>th</sup> Mar. 2014  
“Methyl benzene sensors using Cr-doped nickel oxide nano-structures and fabrication method thereof”

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### **TECHNOLOGY TRANSFERS**

1. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, S.-H. Choi, **Kor. Pat. 10-1588169**, 1<sup>st</sup> Jul. 2017. KRW 30,000,000.
2. J.-H. Lee, H.-J. Kim, **J.-W. Yoon**, **Kor. Pat. 10-1457374**, 1<sup>st</sup> Jul. 2017. KRW 70,000,000.
3. J.-H. Lee, Y. C. Kang, **J.-W. Yoon**, Y. J. Hong, **Kor. Pat. 10-1616173**, 30<sup>th</sup> Jun. 2014. KRW 20,000,000.