BK21 교육 · 연구의 내실화 방안
: 실질적 Globalization 관점

이머징 소재 기반 창조융합형 인재양성사업단

R&E Initiative for Emerging Materials-based Creative Convergence

May 21, 2014

Department Head, BK21+ Director 이혁모

KAIST

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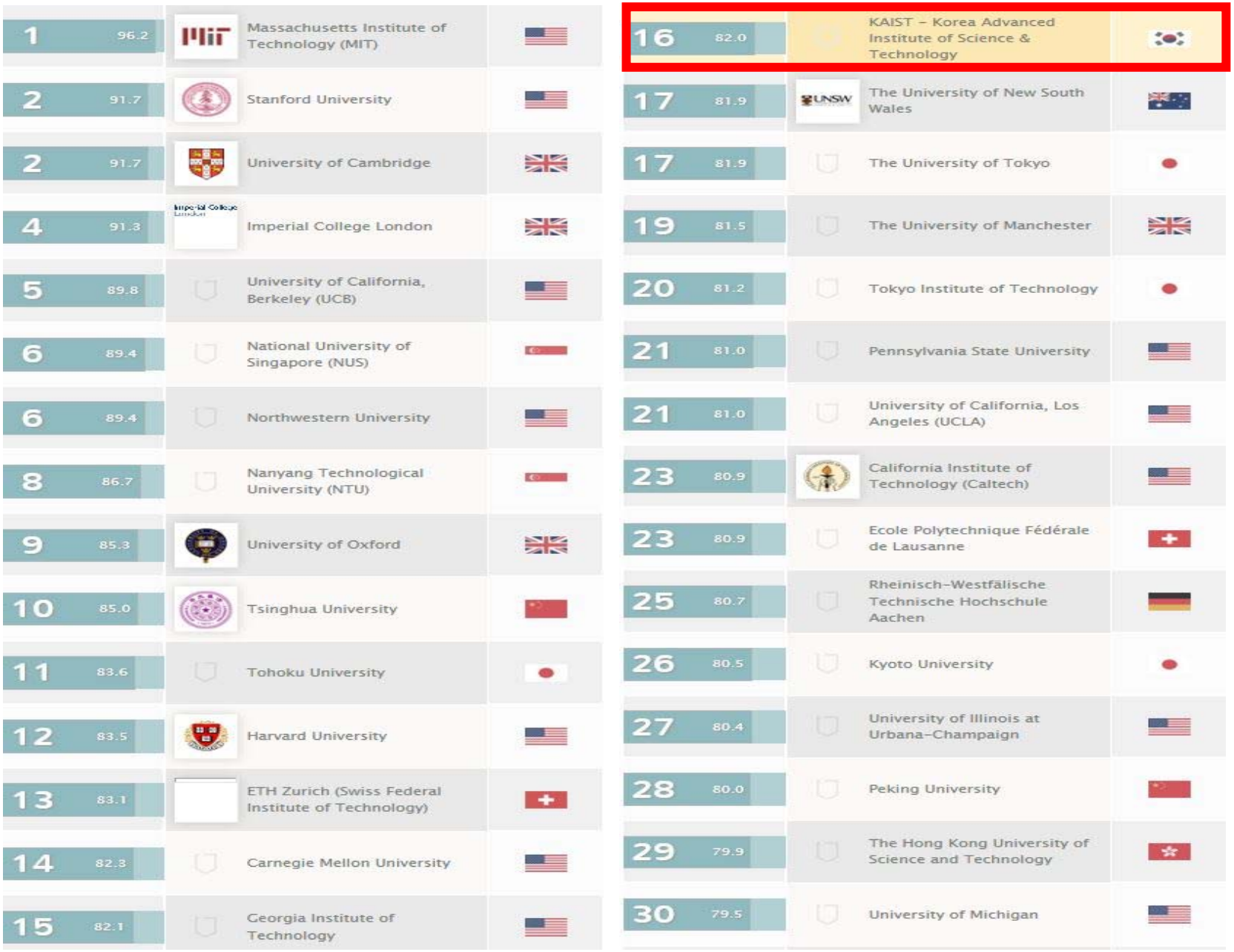
KAIST Emerging Materials R&E Initiative

QS World University Rankings by Subject 2014 – Materials Science



1	96.2	Massachusetts Institute of Technology (MIT)	
2	91.7	Stanford University	
2	91.7	University of Cambridge	
4	91.3	Imperial College London	
5	89.8	University of California, Berkeley (UCB)	
6	89.4	National University of Singapore (NUS)	
6	89.4	Northwestern University	
8	86.7	Nanyang Technological University (NTU)	
9	85.3	University of Oxford	
10	85.0	Tsinghua University	
11	83.6	Tohoku University	
12	83.5	Harvard University	
13	83.1	ETH Zurich (Swiss Federal Institute of Technology)	
14	82.3	Carnegie Mellon University	
15	82.1	Georgia Institute of Technology	
16	82.0	KAIST – Korea Advanced Institute of Science & Technology	
17	81.9	The University of New South Wales	
17	81.9	The University of Tokyo	
19	81.5	The University of Manchester	
20	81.2	Tokyo Institute of Technology	
21	81.0	Pennsylvania State University	
21	81.0	University of California, Los Angeles (UCLA)	
23	80.9	California Institute of Technology (Caltech)	
23	80.9	Ecole Polytechnique Fédérale de Lausanne	
25	80.7	Rheinisch-Westfälische Technische Hochschule Aachen	
26	80.5	Kyoto University	
27	80.4	University of Illinois at Urbana-Champaign	
28	80.0	Peking University	
29	79.9	The Hong Kong University of Science and Technology	
30	79.5	University of Michigan	

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9. QS World University Rankings

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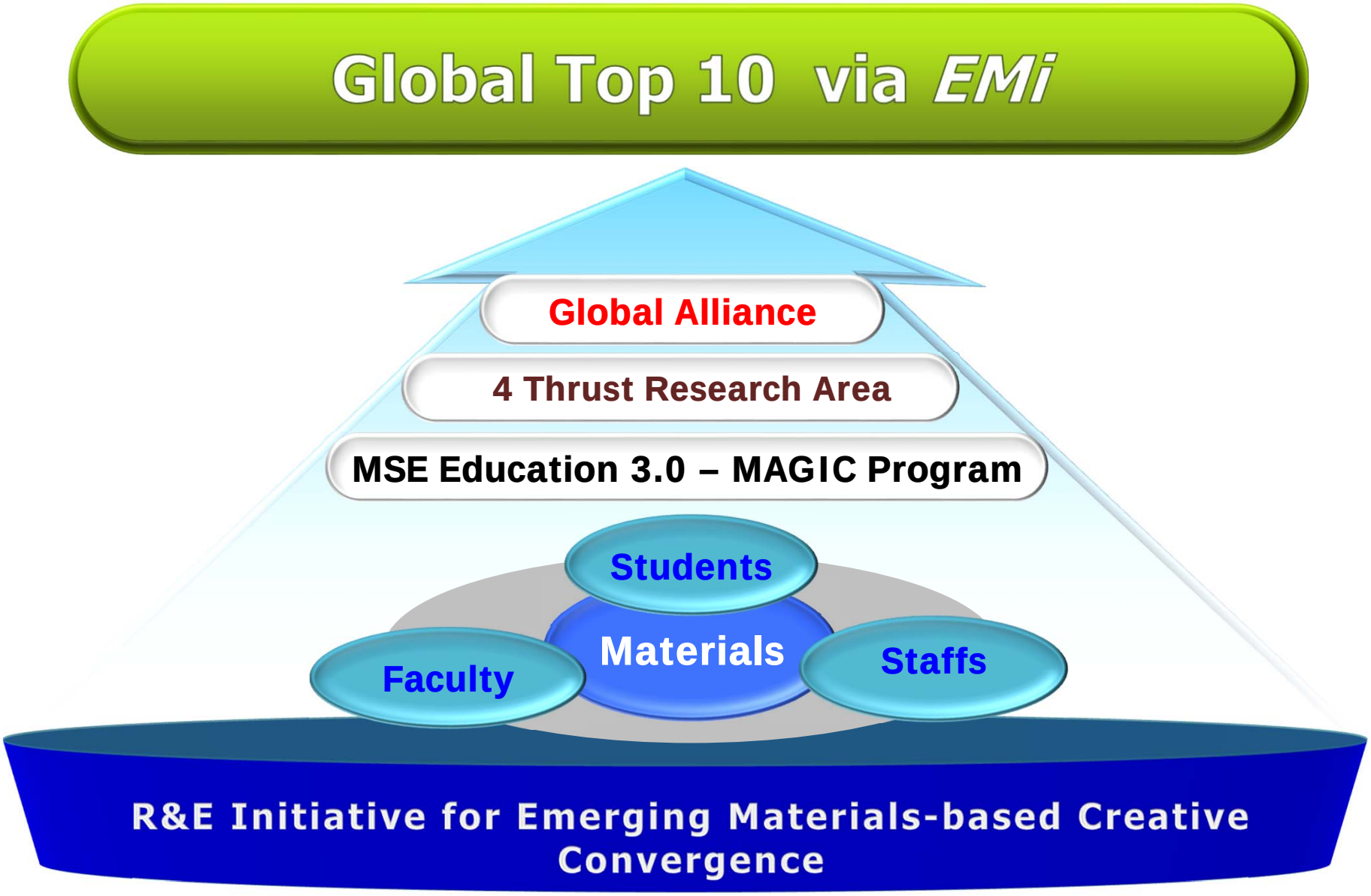
KAIST Emerging Materials R&E Initiative

Vision


Global Top 10 via EMi
Global Alliance
4 Thrust Research Area
MSE Education 3.0 – MAGIC Program
Students
Materials
Faculty
Staffs
R&E Initiative for Emerging Materials-based Creative Convergence

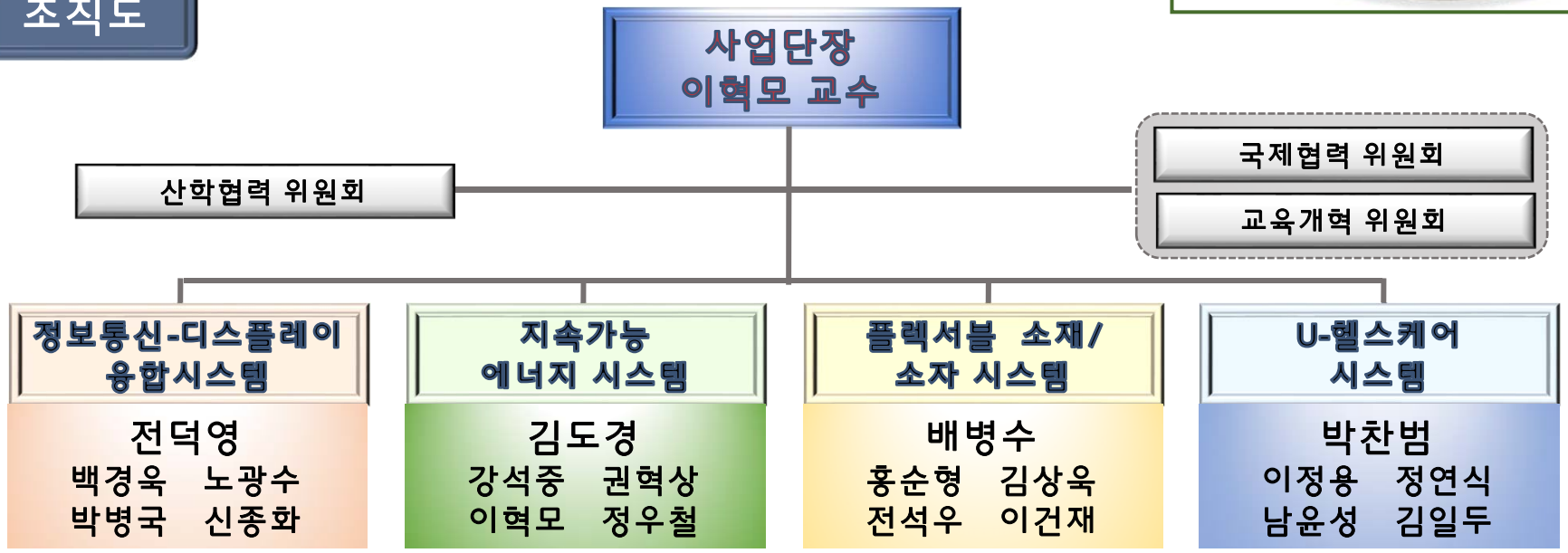
Status

참여현황

(단위: 명)

구분	참여인원 (참여율)	전체인원
교 수	20 (74.07%)	27
신진연구인력	10 (계약교수 5, 연수연구원 5)	
대 학 원 생	218 (77.30%)	282
외국인대학원생	9 (69.23%)	13
전체 대학원생 중 외국인대학원생 4.6% (참여 : 4.1%)		

조직도



교육 비전 및 목표

비전

글로벌 경제의 엔진 역할을 하는 융복합 미래 신소재 산업 분야

창의적 우수 인재 + 통합적 양성 + 리더형 글로벌 인재

신소재 공학 분야 최고의 교육시스템 구축

과학기술, 문화 등 산업 간의 **융합**을 통한 **창조경제** 개척을 주도하는 인력양성

목표

MSE Education 3.0

세부 목표 1: <창의적 우수 인재>양성

수평적 상호작용 및 협력교육을 강조하는 새로운 학습법의 개발과 미래지향적 소재분야 중점교육 프로그램 개발

기존의 교육시스템

- ✓ 일방적 정보전달
- ✓ 제한된 상호작용
- ✓ 수동적 학습
- ✓ 강의자 중심
- ✓ 수직적 관계

Paradigm Shift

창조-리더형 인재양성 교육시스템

- ❖ 개인/분야/산업 맞춤형
- ❖ 온라인 시스템 활용
- ❖ 적극적 자기학습강조
- ❖ 수평적 소통강조

세부 목표 2: <리더형 글로벌 인재>양성

삼성반도체, 하이닉스, LG 이노텍, LGD, LG 화학
개별 프로그램에서의 맞춤형 산학공동교육 운영

MAGIC 프로그램

MSE Education 3.0 & 기본개념

새로운 패러다임의 교육 시스템 구축

전통적 교육
교수가 지식적 우위 점유
많은 지식 소유가 중요
교수 중심 교육
Contents 전달 중심
특정 지역에서 교육
Routine Manual Skill

Education 3.0
인터넷 발달로 교수와 학생의 지식 접근성 동일
지식의 융합과 활용이 중요
학습자 중심 교육
Context 조성 중심
교육의 지역적 한계를 탈피
Non-routine Interactive Skill

지식기반사회 창조형 이공계 교육모델 제시 (I-Four Education Program)

글로벌 협력학습 International	스마트 교육환경 IT-based	학습자 중심 Independent	창의적 융합교육 Integrated
세계 석학들의 OCW 강의제공	디지털 교육 시스템 구축	웹기반 자기주도 학습모델 개발	학제간 융합교육 과정 개발
• 웹 학습자원 제공 • 소집단별 협력학습	• 해외대학과 실시간 화상강의 • 모바일 학습시스템 • I-Four 학습센터	• 수준별 맞춤 학습 • 탐구학습 모델개발 • 학습 선택권 보장	• 인접 학문영역관련 통합적 교육 • 융합관련 교과목의 확대

연구비전 및 추진 전략

이머징 소재 기반 창조융합형 인재양성

- 글로벌 Alliance & MAGIC 산학교육 기반 미래핵심 4대 연구 분야 육성 및 창조융합형 인재양성 -

정보통신-디스플레이 융합시스템	지속가능 에너지 시스템	플렉서블 소재/소자 시스템	U-헬스케어 시스템
▪ 메타물질 기반 광소자 ▪ 차세대 반도체 ▪ 디스플레이 소자	▪ 차세대 전지 ▪ 인공광합성 ▪ 태양광 수소발전	▪ 유연 전자소자 ▪ 유연 투명기판 ▪ 유연 에너지 저장/발전 소자	▪ 고감도 센서 ▪ 광학 검출기 ▪ 바이오 마커/진단용 소재

Global Alliance
국제공동연구/인력 교류협력 (MOU 체결)

- Argonne National Lab (energy)
- Imperial College, London (electronics)
- UIUC (ICT-fusion)
- MIT (multi-functional)
- NTU, Singapore (biomaterials)
- Tohoku Univ. (metals, ceramics)

MSE Educational Advance for Global Industry-Academy Collaboration (MAGIC 산학교육 프로그램)

- 산업계 현장 적응 및 경영 능력 강화 리더십 교육
- 산업계 요구를 적극 반영한 전문 분야별 맞춤형 산학 교육
- 5개 산학 교육 프로그램 구성
- 글로벌 중소-중견 기업 지원

Global Top 10 (2020년)

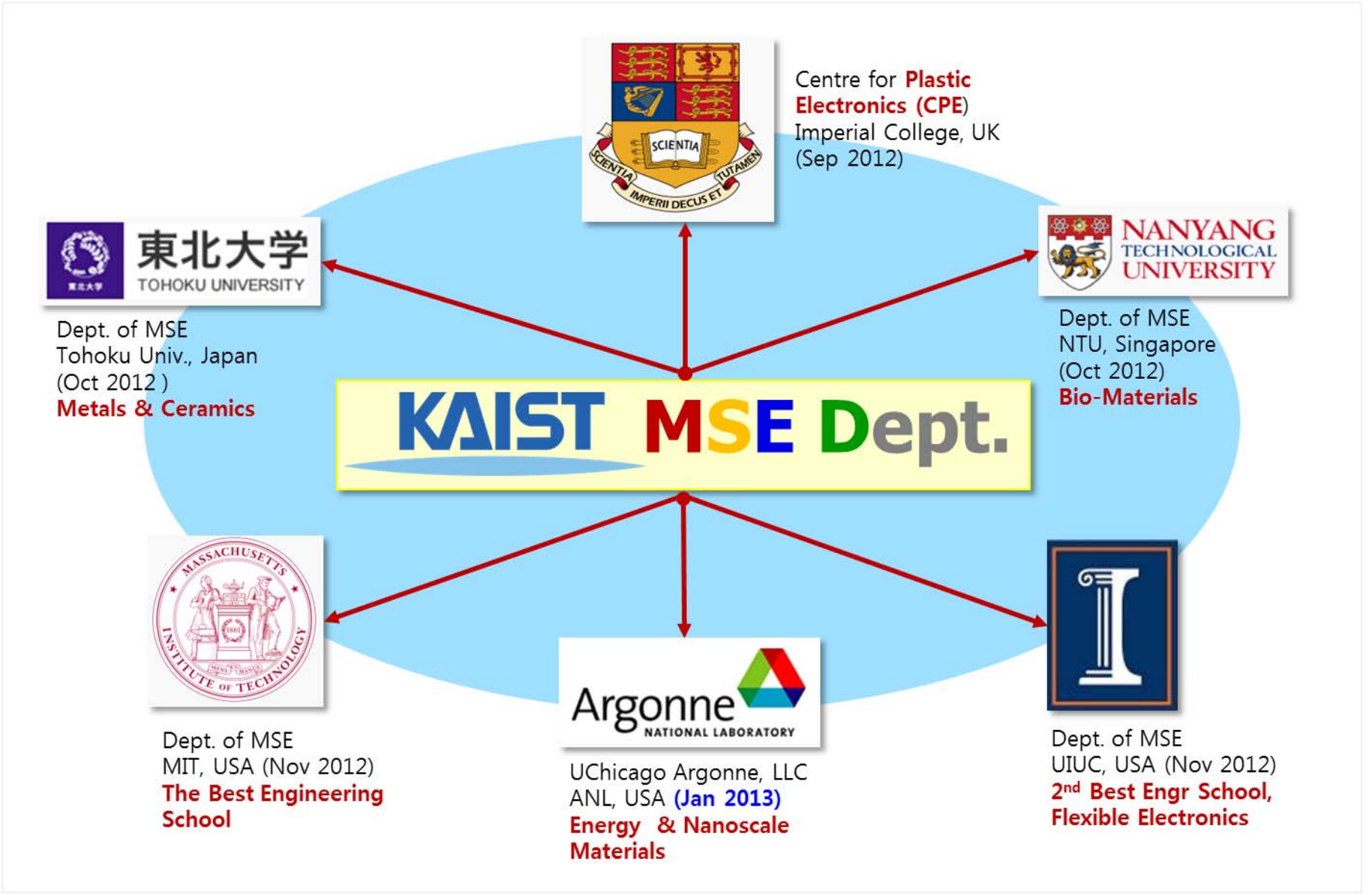
국제협력 전략

Global Top 10 신소재공학과 실현을 위한 세계선도 대학과의 국제화 공동연구 활성화 네트워크 구축

2 Strategy

- 세계 Top 재료공학과와의 추가적인 공동연구 협약 체결
- MOU 체결 기관들과의 인적 물적 교류 활성화

International Cooperation (MOU)



Achievement_1-1 * Imperial College London

- **The 1st Korea-UK Workshop on Plastic Electronics**
- **MOU signed with Centre for Plastic Electronics Imperial College**

- Held on Sep 7, 2012 (KOREA)
- KI Bldg. KAIST
- Imperial College, National Physical Laboratory KAIST(Profs. Sang Ouk Kim, Duk Young Jeon, Seunghyup Yoo), SNU(Profs. Changhee Lee, Jang-Joo Kim)

- **The 1st Korea-UK Students Exchange Program 2012**

- Held on Nov 19~23, 2012 (UK)
- KAIST, SNU, Ewha Womans Univ.
- 9 Students to Imperial College, National Physical Laboratory

* Workshop and Poster Session
: Nov 23, 2012 at Imperial College

Achievement_1-2

- **The 2nd Korea-UK Workshop on Plastic Electronics**

- Held on Feb 21, 2013
- The Crowne Plaza Hotel (UK)
- Imperial College, Univ. College London, Univ. Oxford, SNU, Ewha Womans Univ.
  KAIST(Profs. Sang Ouk Kim, Duk Young Jeon, Seunghyup Yoo)

The 2nd UK-Korea Workshop on Plastic Electronics was held on Thursday 21st February at the Crowne Plaza Hotel, Gloucester Road

The 2nd UK-Korea Workshop on Plastic Electronics has held in London on 21st of February 2013, organised by the Centre for Plastic Electronics (CPE) at Physics, Imperial College London and sponsored by Department for Business Innovation and Science in the British Embassy in Seoul (Global Partnerships Fund), EPSRC (International Collaboration grant), Korea Advanced Institute of Science and Technology (World Class University project) and Seoul National University (the Global Frontier Centre project). This workshop has followed the very successful 1st UK - Korea Workshop held at KAIST on 7th September 2012. Academics from both UK (Imperial, UCL and Oxford) and Korean (KAIST, SNU and Ewha) universities have delivered invited talks discussing Physics, Chemistry, Materials and Engineering aspects of Plastic Electronics. The workshop has been well received by ~100 attendees from various universities, industry and other organisations including National Physical Laboratory, Cambridge Display Technology Ltd and Embassy of the Republic of Korea in the UK. It has provided an excellent opportunity to interact among research staff and students from UK and Korea. Future R&D opportunities have been identified and are being progressed between UK and Korean organisations.

- **The 2nd Korea-UK Students Exchange Program 2013**

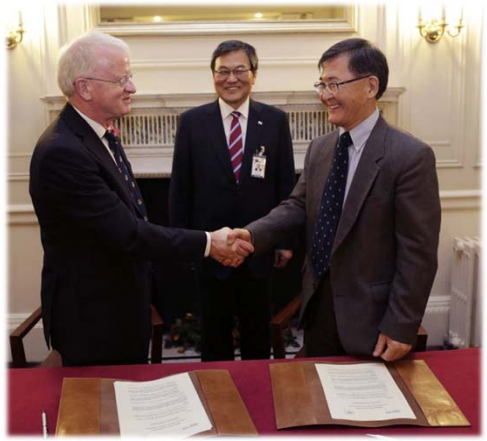
- Held on Mar 18~28, 2013 (Korea)
- KAIST, SNU, Ewha Womans Univ.
- 10 Students from Imperial College

* Workshop and Poster Session
: Mar 20, 2013 at KAIST

Achievement_1-3

- **UK-Korea Creative Economy and Future Sci Forum including the 3rd Korea-UK Workshop on Plastic Electronics**

Prof. Ji-Seon KIM & Prof. Duk Young Jeon



◎ On November 6, 2013
signed KAIST-ICL MOU

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KAIST Emerging Materials R&E Initiative

Achievement_2

*** Tohoku Univ. & Nanyang Technology Univ.**

• Participation in 2013 Joint Symp on the MSE for the 21st Century

- Held on June 23~26, 2013 at NTHU (Taiwan)
- **4개국/7개교** (**KAIST**-GIST-POSTECH-KU-**TU**-NTHU-**NTU**)
- 3 Professors and 19 Students from KAIST
- Symposium was held in Taiwan with TU and NTU to participate

東北大学 TOHOKU UNIVERSITY

NANYANG TECHNOLOGICAL UNIVERSITY

AGREEMENT FOR ACADEMIC COOPERATION
BETWEEN
Department of Materials Science and Engineering,
TOHOKU UNIVERSITY
AND
Department of Materials Science and Engineering, KOREA
ADVANCED INSTITUTE of SCIENCE and TECHNOLOGY

MEMORANDUM OF UNDERSTANDING ON
ACADEMIC COOPERATION
BETWEEN
School of Materials Science and Engineering,
NANYANG TECHNOLOGICAL UNIVERSITY
AND
Department of Materials Science and Engineering, KOREA ADVANCED
INSTITUTE of SCIENCE and TECHNOLOGY

• MOU signed in Oct. 2012

☞ 2014 Joint Symp on the MSE for the 21st Century will be held in June at TOHOKU Univ.

• International Workshop on Advanced Materials Synthesis Process and Nanostructure

- Held on Mar 10~11, 2014 at Hotel Hananoyu, Sendai (Japan)
- Organized by **TOHOKU** Univ., Monash Univ., **KAIST**
- 1 Professor and 7 Students from KAIST

TOHOKU UNIVERSITY

KAIST 한국과학기술원 SINCE 1971

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KAIST Emerging Materials R&E Initiative

Achievement_3

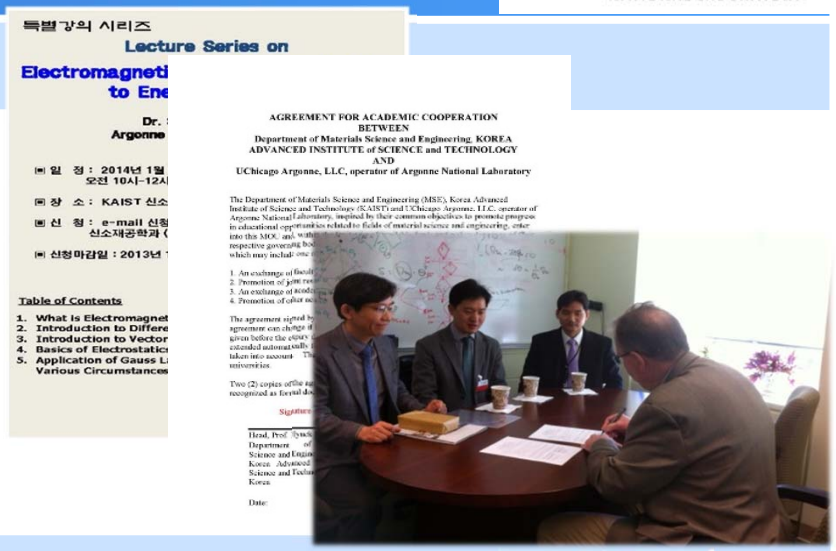
*Argonne National Lab

Argonne NATIONAL LABORATORY

- **MOU signed on Jan 17, 2013**

  ☞ **Adjunct Prof. Dr. Seungbum Hong for special lecture Jan 2014**

  - Electromagnetism and Its Application to Energy Materials



- **Employed as Postdoctors at Argonne National Lab.**



Dr. WI Park ('10) Dr. YY Choi ('10) Dr. JS Lee ('09)


☞ **Prof. Seokwoo Jeon to go for Sabbatical**
- Mar ~ July 2014

☞ **Doctor candidates, Suran Kim to go for research supported by BK21+**
- Feb ~ Nov 2014

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KAIST Emerging Materials R&E Initiative

Achievement_4

*** University of Illinois at Urbana-Champaign**

- **MOU signed on Nov 9, 2012**

☞ **Visiting Prof. Moonsub Shim from UIUC**

- Jul 2013 ~ Jan 2014

- Prof. Moonsub Shim received his B.S. degree from the University of California at Berkeley in 1997 and his M.S. and Ph.D. degrees both from the University of Chicago in 1998 and 2001.
After working as a postdoctoral researcher at Stanford University, he joined the faculty of the Department of Materials Science and Engineering at Illinois in 2002.
Recognitions for his achievements include the Xerox Award for Faculty Research(2007), National Science Foundation CAREER Award (2004), Racheff Assistant Professorship (2002-2004), and the Willett Faculty Scholar Award(2010-2014)

- **Employed as Postdoctors & Doctor candidates at UIUC**


김봉훈 박사 ('07)


강소미('04)


김호준('08)


신정우('08)


이재준('10)

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KAIST Emerging Materials R&E Initiative

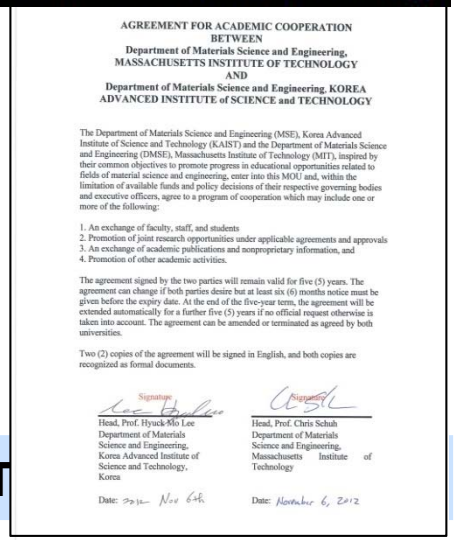
Achievement_5

*Massachusetts Institute of Technology

- **MOU signed on Nov 6, 2012**

Massachusetts Institute of Technology

☞ Prof. Alexander Katz to visit KAIST on Jun 3, 2014



AGREEMENT FOR ACADEMIC COOPERATION
BETWEEN
Department of Materials Science and Engineering,
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
AND
Department of Materials Science and Engineering, KOREA
ADVANCED INSTITUTE of SCIENCE and TECHNOLOGY

The Department of Materials Science and Engineering (MSE), Korea Advanced Institute of Science and Technology (KAIST) and the Department of Materials Science and Engineering (DMSE), Massachusetts Institute of Technology (MIT), inspired by their common objectives to promote progress in educational opportunities related to fields of material science and engineering, enter into this MOU and, within the limitation of available funds and policy decisions of their respective governing bodies and executive officers, agree to a program of cooperation which may include one or more of the following:

1. An exchange of faculty, staff, and students
2. Promotion of joint research opportunities under applicable agreements and approvals
3. An exchange of academic publications and nonproprietary information, and
4. Promotion of other academic activities.

The agreement signed by the two parties will remain valid for five (5) years. The agreement can change if both parties desire but at least six (6) months notice must be given before the expiry date. At the end of the five-year term, the agreement will be extended automatically for a further five (5) years if no official request otherwise is taken into account. The agreement can be amended or terminated as agreed by both universities.

Two (2) copies of the agreement will be signed in English, and both copies are recognized as formal documents.

Signature
Head, Prof. Hyuck Mo Lee
Department of Materials Science and Engineering, Korea Advanced Institute of Science and Technology, Korea
Date: Nov 6th

Signature
Head, Prof. Chris Schuh
Department of Materials Science and Engineering, Massachusetts Institute of Technology
Date: November 6, 2012

- **Employed as Postdoctors & Doctor candidates at MIT**

Postdoctors

Nikolay 박사 **(‘08)**

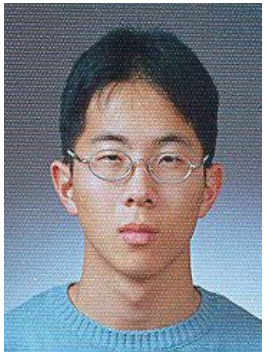
류정기 박사 **(‘07)**

이선화 박사 **(’07)**

Doctor candidates

이동욱 **(’06)**

김진영 **(’03)**



장재범 **(’01)**

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KAIST Emerging Materials R&E Initiative

장기해외연수(47명 대학원생/7개국)

	성명	일정	기간(개월)	연수기관	연수국
1	장준혁	2006. 6. ~ 2006. 11.	5	NIMS	일본
2	조근우	2006. 9. ~ 2007. 1.	4	Queen's University	캐나다
3	김하늘	2007. 1. ~ 2007. 4.	3	Georgia Institute of Technology	미국
4	이정섭	2007. 1. ~ 2007. 3.	1	Perdue University	미국
5	김세윤	2007. 2. ~ 2008. 2.	12	UCSB	미국
6	김승완	2007. 2. ~ 2007. 8.	6	Univ. of Penn.	미국
7	이성환	2007. 2. ~ 2007. 8.	6	Brown Univ.	미국
8	김현유	2007. 5. ~ 2007. 10.	6	UCSB	미국
9	서선경	2007. 8. ~ 2007. 12.	3	IBM Watson Research Center	미국
10	정회성	2007. 10. ~ 2008. 1.	3	Purdue Univ.	미국
11	김윤경	2007. 12. ~ 2008. 2.	1	NIMS	일본
12	류성우	2007. 12. ~ 2008. 1.	1	The Univ. of Texas at Dallas	미국
13	장준혁	2008. 1. ~ 2008. 2.	1	NIMS	일본
14	박문규	2008. 3. ~ 2009. 2.	10	Argonne National Lab.	미국
15	정용	2008. 4. ~ 2009. 1.	9	Fraunhofer IZM	독일
16	장재명	2008. 5. ~ 2008. 8.	2	SiMAP, INPG	프랑스
17	이가인	2008. 6. ~ 2008. 8.	3	Caltech	미국
18	조윤환	2008. 7. ~ 2008. 12.	6	IBM Watson Research Center	미국
19	이혜연	2008. 7. ~ 2009. 2.	7	NIMS	일본
20	선창우	2008. 7. ~ 2009. 7.	12	UIUC	미국
21	육종민	2008. 8. ~ 2009. 8.	12	National Center for Electron Microscopy	미국
22	이선화	2008. 9. ~ 2009. 5.	9	Univ. of Texas, Austin	미국
23	유정준	2008. 9. ~ 2009. 8.	12	Rice University	미국
24	김승완	2008. 9. ~ 2009. 11.	14	Univ. of Penn.	미국
25	김봉훈	2009. 12. ~ 2010. 12.	12	UCB	미국
26	류지훈	2009. 3. ~ 2009. 8.	6	UCSB	미국
27	이정우	2009. 3. ~ 2009. 5.	3	Rice University	미국
28	김지윤	2009. 6. ~ 2010. 6.	12	Argonne National Lab.	미국
29	황재원	2009. 7. ~ 2009. 9.	2	Alan G. Macdiarmid NanoTech Ins.	미국
30	진성환	2009. 8. ~ 2009. 10.	2	Univ. of Texas, Austin	미국
31	장준혁	2009. 9. ~ 2010. 2.	5	NIMS	일본
32	이현욱	2010. 2. ~ 2010. 4.	3	Universita' degli Studi Di Milano-Bicocca	이탈리아
33	김승완	2010. 3. ~ 2010. 10.	8	Univ. of Pennsylvania	미국
34	김다혜	2010. 3. ~ 2010. 8.	6	Univ. of Texas at Austin	미국
35	최현우	2010. 7. ~ 2011. 7.	12	Argonne National Lab.	미국
36	류원희	2010. 9. ~ 2011. 4.	7	Argonne National Lab.	미국
37	이주호	2011. 2. ~ 2012. 2.	12	Univ. of Tokyo	일본
38	구숙희	2011. 4. ~ 2012. 1.	9	Univ. of Washington	미국
39	이현욱	2011. 4. ~ 2011. 6.	2	Stanford Univ.	미국
40	김동진	2011. 6. ~ 2012. 6.	12	Argonne National Lab.	미국
41	김지은	2011. 9. ~ 2012. 8.	11	Stanford Univ.	미국
42	장재원	2011. 9. ~ 2012. 1.	4	IBM Watson Research Center	미국
43	정인유	2011. 12. ~ 2012. 2.	2	Columbia Univ.	미국
44	윤기로	2012. 6. ~ 2012. 9.	2	Technology-Israel Institute of Technology	이스라엘
45	장봉훈	2012. 6. ~ 2012. 9.	2	Technology-Israel Institute of Technology	이스라엘
46	여상철	2012. 7. ~ 2012. 9.	3	MIT	미국
47	변세기	2012. 10. ~ 2013. 2.	5	Northwestern Univ.	미국
48	**변세기**	**2013. 11. ~ 2014. 2.**	**4**	**Northwestern Univ.**	**미국**
49	**김수란**	**2014. 2. ~ 2014. 11.**	**8**	**Argonne National Lab.**	**미국**
50	**신기현**	**2014. 7. ~ 2015. 1.**	**6**	**Stanford Univ.**	**미국**
51	**김나래**	**2014. 11. ~ 2015. 5.**	**7**	**Harvard Univ.**	**미국**

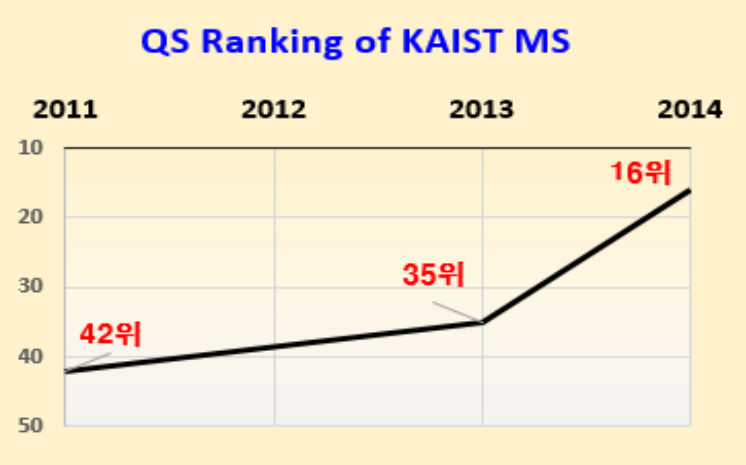
Penn University of Pennsylvania

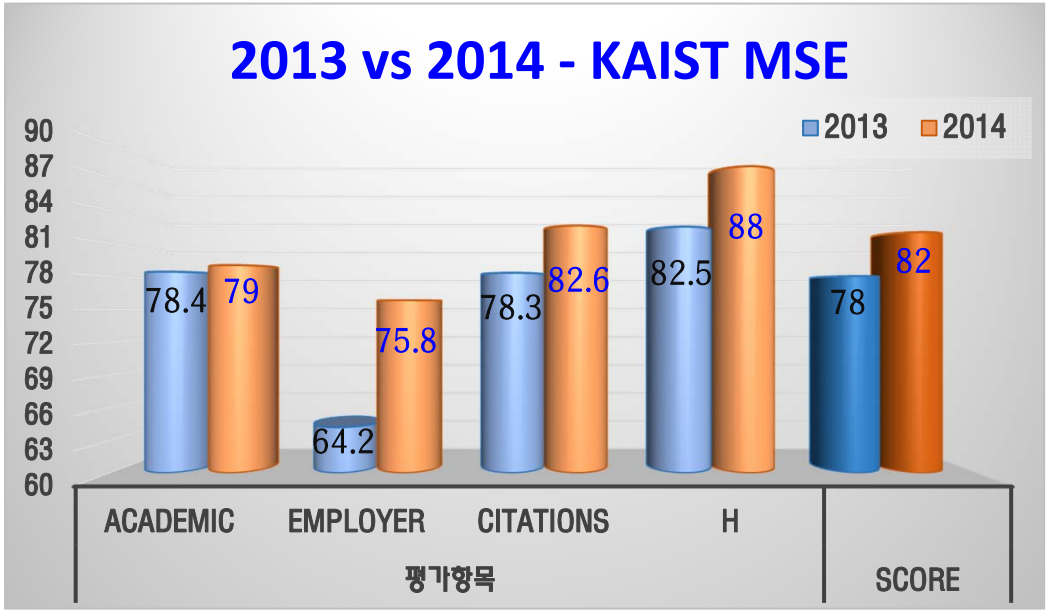
RICE Unconventional Wisdom

NIMS National Institute for Materials Science

Fraunhofer

KAIST 신소재공학과 QS Ranking (연도별)





	평가항목				Score	Ranking
	Academic	Employer	Citations	H		
2014	79	75.8	82.6	88	82	16
2013	78.4	64.2	78.3	82.5	78	35
2012	혼돈 속 KAIST 제대로 자료 제출 못함					
2011	49.9	5.9	32.2		40.2	42

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QS World University Rankings by Subject 2014 – Materials Science

1	96.2	Massachusetts Institute of Technology (MIT)	
2	91.7	Stanford University	
2	91.7	University of Cambridge	
4	91.3	Imperial College London	
5	89.8	University of California, Berkeley (UCB)	
6	89.4	National University of Singapore (NUS)	
6	89.4	Northwestern University	
8	86.7	Nanyang Technological University (NTU)	
9	85.3	University of Oxford	
10	85.0	Tsinghua University	
11	83.6	Tohoku University	
12	83.5	Harvard University	
13	83.1	ETH Zurich (Swiss Federal Institute of Technology)	
14	82.3	Carnegie Mellon University	
15	82.1	Georgia Institute of Technology	
16	82.0	KAIST – Korea Advanced Institute of Science & Technology	
17	81.9	The University of New South Wales	
17	81.9	The University of Tokyo	
19	81.5	The University of Manchester	
20	81.2	Tokyo Institute of Technology	
21	81.0	Pennsylvania State University	
21	81.0	University of California, Los Angeles (UCLA)	
23	80.9	California Institute of Technology (Caltech)	
23	80.9	Ecole Polytechnique Fédérale de Lausanne	
25	80.7	Rheinisch-Westfälische Technische Hochschule Aachen	
26	80.5	Kyoto University	
27	80.4	University of Illinois at Urbana-Champaign	
28	80.0	Peking University	
29	79.9	The Hong Kong University of Science and Technology	
30	79.5	University of Michigan	

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