

**Dr. Akira Toriumi**  
**Professor**  
**Department of Materials Engineering**  
**School of Engineering**  
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**7-3-1, Hongo, Tokyo 113-8656, Japan**

**Birth**

Tokyo, Japan in August 3, 1953

**Education**

The University of Tokyo, Department of Applied Physics, Tokyo, Japan	1980 – 1983
1983: Dr. E, Applied Physics	
The University of Tokyo, Department of Applied Physics, Tokyo, Japan	1978 – 1980
1980: M.E., Applied Physics	
The University of Tokyo, Department of Physics, Tokyo, Japan	1974 – 1978
1978: B.S., Physics	

**Employment / research experience**

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| (1) The University of Tokyo, 7-3-1 Hongo, Tokyo 113-8656, Japan                      |                |
| Professor, Department of Materials Engineering                                       | 2000 – Present |
| (2) National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan |                |
| Group leader of Advanced Gate Stack Technology, MIRAI Project                        | 2001 – 2008    |
| Research and development of high-k gate stack technology                             |                |
| (3) Toshiba Corporation, 1, Komukai Toshiba-cho, Kawasaki, Japan                     |                |
| Research and management  | 1983 – 2000    |
| Si-CMOS device physics, dielectric reliability and Si new devices,                   |                |
| (4) Massachusetts Institute of Technology, Cambridge, MA, USA                        | 1988 – 1990    |
| Visiting scientist on leave from Toshiba   |                |
| Physics of electron transport in quantum devices                                     |                |

**Current research interests**

✧ High-k Dielectrics

Research of new dielectric materials with high dielectric constant (high-k). Our group succeeded in the permittivity enhancement technology of thin HfO<sub>2</sub> film and found the dipole layer formation at the high-k and SiO<sub>2</sub> interface. Now we are interested in the design of dielectric film properties.

✧ Ge MOSFETs

Germanium CMOS is one of our current interests, since its mobility is much higher than silicon. But, intensive research is very rare, since the reliable gate dielectric film is difficult to form and Schottky barriers is hard to control. We have demonstrated metal source/drain n-ch Ge MOSFET operation for the first time.

✧ Functional metal oxides

Metal oxides show not only insulating properties but also various functional characteristics. We are now interested in the field-induced atom motion in oxides film both from application and materials science.

#### ✧ Carbon-based Electronics

Science and technology of both organic TFTs and graphene are very attractive not only from application but also fundamental materials science. We are working on the development of high performance pentacene TFTs and on the characterization of graphene from the viewpoints of graphene/metal and graphene/insulator interfaces. .

### **Membership in professional organization**

The Japan Society of Applied Physics (JSAP), Fellow  
 The Physical Society of Japan (JPS)  
 The Institute of Electrical & Electronics Engineers (IEEE)  
 American Physical Society (APS)  
 Material Research Society (MRS)  
 Electrochemical Society (ECS)

### **Honors and awards**

IEEE EDS Paul Rappaport Award	2004
IEEE International Reliability Physics Symposium, Best Paper Award	1997
JSAP Solid-State Device and Materials, Best Paper Award	2000 & 2003

### **Publications and presentations**

Over 250 publications in peer-reviewed journals, refereed conference proceedings.  
 A number of short course lectures in international conferences such as IEDM, VLSI Symposium, SSDM.

### **Conference organizer/ program committee**

Executive Committee	
VLSI Symposium	2008-present
Executive Committee	
The Japan Society of Applied Physics	2004-2006
Program Chair	
International Solid State devices and Materials	2005
International Workshop of Dielectric Thin Films	2006
General Chair	
Si-Nanoelectronics Workshop (IEEE/JSAP)	1999
Conference Program Committee Member (past)	
IEEE-IEDM, DRC, SISC, MRS, ECS	
AVS-PCSI (present)	
Many topical conferences and workshops in Japan	
Associate editor of technical journals	
IEEE Transaction of Nanotechnology (Past)	
Science and Technology of Advanced Materials (Past)	