

# AIP (AMERICAN INSTITUTE OF PHYSICS) 매뉴얼

신원데이터넷  
info@shinwon.co.kr

1. 출판사 소개

2. Scitation 소개

3. Scitation 이용방법

4. AIP Publishing 이용방법

## ❖ AIP (American Institute of Physics)



**American Institute of Physics**는 Member Societies에서 제공하는 General Physics, Applied Physics, Chemical Physics, Medical Physics, Astronomy, Electronics, Materials Science 등 물리학 관련 출판물을 출간하고 대행하는 학회입니다.

URL : <http://www.aip.org>

## ❖ AIP Publishing



**AIP Publishing**은 세계적인 물리학 공동체의 높은 인용을 자랑하는 과학정보를 제공합니다. AIP Publishing의 포트폴리오에는 Applied Physics Letters, Applied Physics, Chemical Physics 및 AIP Conference Proceedings 시리즈와 같은 권위 있는 타이틀이 포함되어 있습니다.

URL : <http://publishing.aip.org>

### ❖ Scitation

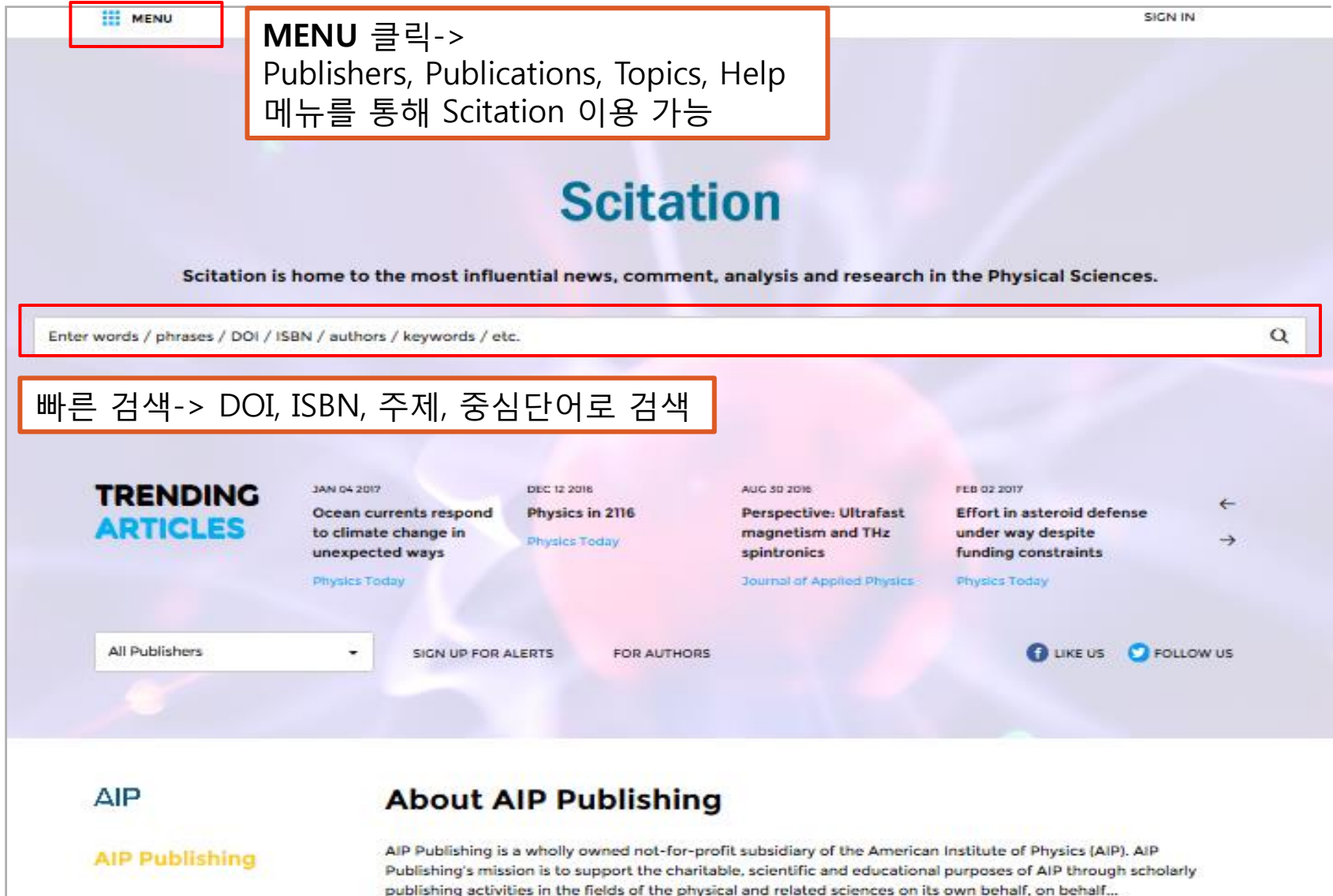


AIP 및 Member Societies에서 제공하는 저널을 검색하는 Portal Site 이며, 검색결과를 찾는 과정으로 저널명 혹은 출판사 등 단계적으로 원하는 Article을 검색 하실 수 있습니다.

URL: <http://www.scitation.org>



# 3. SCITATION – MAIN PAGE



**MENU** 클릭->  
Publishers, Publications, Topics, Help  
메뉴를 통해 Scitation 이용 가능

**Scitation**

Scitation is home to the most influential news, comment, analysis and research in the Physical Sciences.

Enter words / phrases / DOI / ISBN / authors / keywords / etc.

빠른 검색-> DOI, ISBN, 주제, 중심단어로 검색

**TRENDING ARTICLES**

Date	Article Title	Journal
JAN 04 2017	Ocean currents respond to climate change in unexpected ways	Physics Today
DEC 12 2016	Physics in 2116	Physics Today
AUG 30 2016	Perspective: Ultrafast magnetism and THz spintronics	Journal of Applied Physics
FEB 02 2017	Effort in asteroid defense under way despite funding constraints	Physics Today

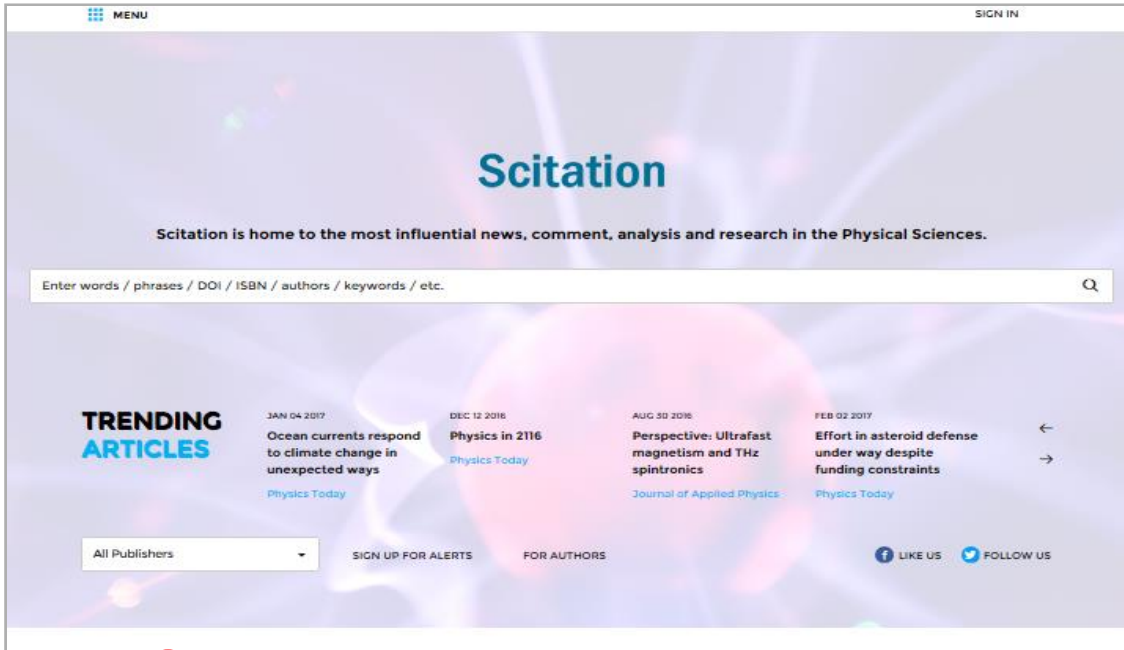
All Publishers | SIGN UP FOR ALERTS | FOR AUTHORS | LIKE US | FOLLOW US

**AIP**

**About AIP Publishing**

AIP Publishing is a wholly owned not-for-profit subsidiary of the American Institute of Physics (AIP). AIP Publishing's mission is to support the charitable, scientific and educational purposes of AIP through scholarly publishing activities in the fields of the physical and related sciences on its own behalf, on behalf...

# 3. SCITATION – ALL PUBLISHING BROWSE



AIP ①

AIP Publishing

## About AIP Publishing

AIP Publishing is a wholly owned not-for-profit subsidiary of the American Institute of Physics (AIP). AIP Publishing's mission is to support the charitable publishing activities in the fields of the physical

- Acoustical Society of America
- All Publishers
- AIP Publishing
- Acoustical Society of America
- American Association of Physics Teachers
- American Crystallographic Association Inc.
- AVS: Science & Technology of Materials Interfaces, and Processing
- Chinese Physical Society
- Laser Institute of America
- The Society of Rheology
- Computing in Science and Engineering

SIGN UP FOR ALERTS

FOR AUTHORS

LIKE US

FOLLOW US

②

## About AIP Publishing

AIP Publishing is a wholly owned not-for-profit subsidiary of the American Institute of Physics (AIP). AIP Publishing's mission is to support the charitable, scientific and educational purposes of AIP through scholarly publishing activities in the fields of the physical and related sciences on its own behalf, on behalf...

READ MORE

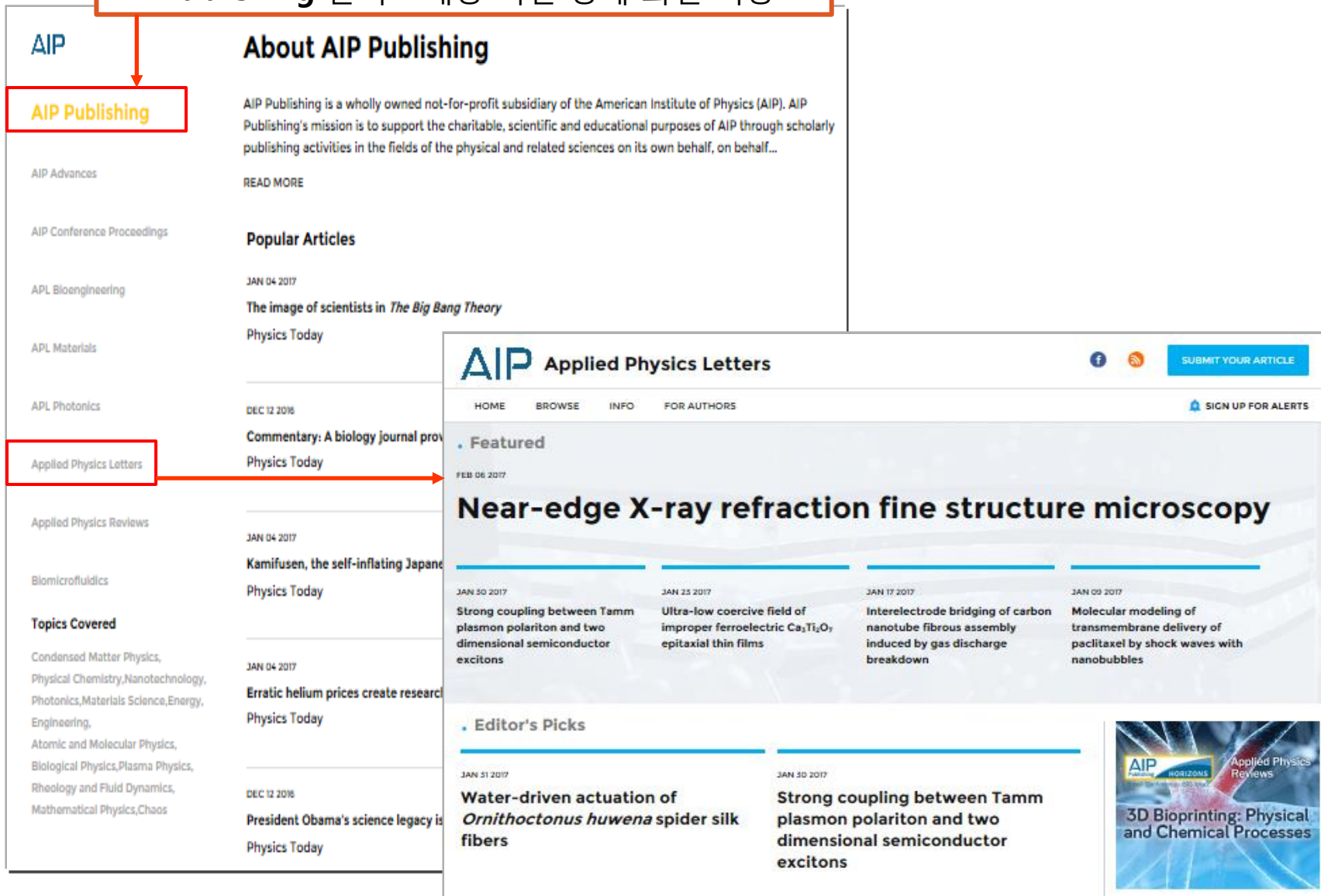
### Popular Articles

JAN 04 2017

**The image of scientists in *The Big Bang Theory***  
Physics Today

All Publishers Browse 클릭 ->  
AIP에서 제공하는 다양한  
출판사의 자료를 검색 가능

All Publishing 클릭->해당 저널 상세 화면 이동



The image shows a screenshot of the AIP Publishing website. On the left is a navigation sidebar with a list of journals. A red box highlights 'AIP Publishing' at the top, and another red box highlights 'Applied Physics Letters' further down. A red arrow points from the 'Applied Physics Letters' box to the main content area. The main content area is titled 'About AIP Publishing' and includes a description of the organization's mission. Below this is a 'Popular Articles' section with several article teasers. A large inset window shows the 'Applied Physics Letters' journal homepage. The homepage features a 'Featured' article titled 'Near-edge X-ray refraction fine structure microscopy' dated FEB 06 2017. Below the featured article are 'Editor's Picks' with two articles: 'Water-driven actuation of *Ornithoctonus huwena* spider silk fibers' and 'Strong coupling between Tamm plasmon polariton and two dimensional semiconductor excitons'. A 'Submit Your Article' button is visible in the top right of the journal homepage.

**AIP Publishing**

**About AIP Publishing**

AIP Publishing is a wholly owned not-for-profit subsidiary of the American Institute of Physics (AIP). AIP Publishing's mission is to support the charitable, scientific and educational purposes of AIP through scholarly publishing activities in the fields of the physical and related sciences on its own behalf, on behalf...

READ MORE

**Popular Articles**

JAN 04 2017  
**The image of scientists in *The Big Bang Theory***  
Physics Today

DEC 12 2016  
**Commentary: A biology journal pro...**  
Physics Today

JAN 04 2017  
**Kamifusen, the self-inflating Japane...**  
Physics Today

JAN 04 2017  
**Erratic helium prices create researc...**  
Physics Today

DEC 12 2016  
**President Obama's science legacy is...**  
Physics Today

**AIP Applied Physics Letters**

HOME BROWSE INFO FOR AUTHORS SIGN UP FOR ALERTS

**Featured**

FEB 06 2017

**Near-edge X-ray refraction fine structure microscopy**

JAN 30 2017  
**Strong coupling between Tamm plasmon polariton and two dimensional semiconductor excitons**

JAN 25 2017  
**Ultra-low coercive field of improper ferroelectric  $\text{Ca}_3\text{Ti}_2\text{O}_7$  epitaxial thin films**

JAN 17 2017  
**Interelectrode bridging of carbon nanotube fibrous assembly induced by gas discharge breakdown**

JAN 09 2017  
**Molecular modeling of transmembrane delivery of paclitaxel by shock waves with nanobubbles**

**Editor's Picks**

JAN 31 2017  
**Water-driven actuation of *Ornithoctonus huwena* spider silk fibers**

JAN 30 2017  
**Strong coupling between Tamm plasmon polariton and two dimensional semiconductor excitons**

**3D Bioprinting: Physical and Chemical Processes**

① MENU->Publications More 클릭



<b>Publishers</b>	<b>Publications</b>	<b>Topics</b>
<b>Conference Proceedings</b>	Applied Physics Letters	Acoustics
<b>Author Resources</b>	Journal of Applied Physics	Biological Physics
<b>Librarian Resources</b>	The Journal of Chemical Physics	Condensed Matter Physics
<b>Contact Us</b>	Physics Today	Energy
<b>Help</b>	The Journal of the Acoustical Society of America	
<b>Scitation</b>	Review of Scientific Instruments	
	American Journal of Physics	
	Physics of Fluids	
	Physics of Plasmas	
	AIP Advances	
	<b>More</b>	

② AIP가 제공하는 출판물의 전체 보기가 가능



## Scitation Publications

Acoustics Research Letters Online	Journal of Physical and Chemical Reference Data
AIP Advances	Journal of Renewable and Sustainable Energy
AIP Conference Proceedings	Journal of Rheology
American Journal of Physics	The Journal of the Acoustical Society of America
APL Bioengineering	Journal of Vacuum Science & Technology
APL Materials	Journal of Vacuum Science & Technology A: Vacuum, Microelectronics, Materials, Processing, Measurement
APL Photonics	Journal of Vacuum Science & Technology B: Nanotek Microelectronics, Materials, Processing, Measurement
Applied Physics Letters	Low Temperature Physics
Applied Physics Reviews	Magnetism and Magnetic Materials
Biointerphases	Noise Control
Biomechanics	Physics of Fluids
Chaos: An Interdisciplinary Journal of Nonlinear Science	Physics of Plasmas
Chinese Journal of Chemical Physics	The Physics Teacher
Computing in Science & Engineering	Physics Today
JASA Express Letters	Proceedings of Meetings on Acoustics
Journal of Applied Physics	Review of Scientific Instruments
The Journal of Chemical Physics	Sound: Its Uses and Control
Journal of Laser Applications	Structural Dynamics
Journal of Mathematical Physics	Surface Science Spectra



Publishers	Publications	Topics
Conference Proceedings	Applied Physics Letters	Acoustics
Author Resources	Journal of Applied Physics	Biological Physics
Librarian Resources	The Journal of Chemical Physics	Condensed Matter Physics
	Physics Today	Energy
		Materials Science
		Mathematical Physics
		Optics and Optical Physics
		Physical Chemistry
		Plasma Physics
		Rheology and Fluid Dynamics
		More

## Scitation

**• Topics**

Browse content quickly and easily by topic by selecting broad categories or more specific subdisciplines. The browse function is supported by the powerful Scitation thesaurus (7,500+ terms) developed to address researchers' information needs.

- ▣ Acoustics (165264)
  - ▣ Acoustic instrumentation (34682)
  - ▶ Acoustic modeling (12052)
  - ▣ Acoustic noise (23415)
    - ▣ Acoustic signal processing (24976)
    - ▣ Acoustical measurements (37864)
  - ▶ Acoustical properties (8883)
    - ▣ Aeroacoustics (13562)
    - ▣ Architectural acoustics (12538)
    - ▣ Bioacoustics (32593)
    - ▣ Linear acoustics (38293)
    - ▣ Musical acoustics (74307)
    - ▣ Nonlinear acoustics (44548)
    - ▣ Physiological acoustics (12177)
    - ▣ Psychological acoustics (16884)
    - ▣ Speech (23867)
    - ▣ Structural acoustics (7076)
    - ▣ Ultrasonics (18276)
    - ▣ Underwater sound (7192)
  - ▣ Astronomy and astrophysics (53568)
  - ▣ Atomic and molecular physics (115039)
  - ▣ Biological physics (95699)
  - ▣ Condensed matter physics (442719)
  - ▣ Energy (45858)
  - ▣ General physics (619153)
  - ▣ Geophysics (157129)
  - ▣ Interdisciplinary physics (263135)
  - ▣ Materials science (453462)
  - ▣ Mathematical physics (227864)
  - ▣ Nanotechnology (71835)
  - ▣ Nuclear physics (73273)
  - ▣ Optics and optical physics (372075)
  - ▣ Particle physics (108395)
  - ▣ Physical chemistry (291946)
  - ▣ Plasma physics (105971)
  - ▣ Quantum mechanics (172343)

**1**

**MENU**  
-> Topics More 클릭  
주제 전체 보기 가능

**2**

Topics->Acoustics 클릭->  
단어 앞의 □ 상자 클릭->  
더 자세한 연관 주제 검색 가능

URL: <http://aip.scitation.org>

**AIP Publishing**

HOME BROWSE SIGN UP FOR ALERTS

### About AIP Publishing

AIP Publishing is a wholly owned not-for-profit subsidiary of the American Institute of Physics (AIP). AIP Publishing's mission is to support the charitable, scientific and educational purposes of AIP through scholarly publishing activities in the fields of the physical and related sciences on its own behalf, on behalf of Member Societies of AIP, and on behalf of other publishing partners to help them proactively advance their missions. AIP Publishing's portfolio comprises 19 highly regarded, peer-reviewed journals, including the flagship journals *Applied Physics Letters*, *Journal of Applied Physics*, and *The Journal of Chemical Physics*, in addition to the *AIP Conference Proceedings*.

### Publications

- AIP Advances
- AIP Conference Proceedings
- APL Bioengineering
- APL Materials
- APL Photonics
- Applied Physics Letters
- Applied Physics Reviews
- Biomicrofluidics
- Chaos: An Interdisciplinary Journal of Nonlinear Science
- Computing in Science & Engineering
- Journal of Applied Physics
- The Journal of Chemical Physics
- Journal of Mathematical Physics
- Journal of Physical & Chemical Reference Data
- Journal of Renewable & Sustainable Energy

### Featured

FEB 06 2017  
Near-edge X-ray refraction fine structure microscopy  
Applied Physics Letters

FEB 02 2017  
Size effects and charge transport in metals: Quantum theory of the resistivity of nanometric metallic structures arising from electron scattering by grain boundaries and by rough surfaces  
Applied Physics Reviews

FEB 01 2017  
Raman-strain relations in highly strained Ce: Uniaxial (100), (110) and biaxial (001) stress  
Journal of Applied Physics

FEB 01 2017  
Antisolvent-assisted powder engineering for controlled growth of hybrid  $\text{CH}_3\text{NH}_3\text{PbI}_3$  perovskite thin films  
APL Materials

FEB 02 2017  
Effort in asteroid defense under way despite funding constraints  
Physics Today

**AIP Publishing Home page**  
- AIP 출판사의 모든 출판물과 주요 아티클을 확인할 수 있음

**AIP Publishing**

HOME **BROWSE**

## About AIP Publishing

AIP Publishing is a wholly owned not-for-profit subsidiary of the American Institute of Physics (AIP). AIP Publishing's mission is to support the charitable, scientific and educational purposes of AIP through scholarly publishing activities in the fields of the physical and related sciences on its own behalf, on behalf of Member Societies of AIP, and on behalf of other publishing partners to help them proactively advance their missions. AIP Publishing's portfolio comprises 19 highly regarded, peer-reviewed journals, including the flagship journals *Applied Physics Letters*, *Journal of Applied Physics*, and *The Journal of Chemical Physics*, in addition to the *AIP Conference Proceedings*.

### Publications

- AIP Advances
- AIP Conference Proceedings
- APL Bioengineering
- APL Materials
- APL Photonics
- Applied Physics Letters
- Applied Physics Reviews
- Biomicrofluidics
- Chaos: An Interdisciplinary Journal of Nonlinear Science
- Computing in Science & Engineering
- Journal of Applied Physics
- The Journal of Chemical Physics
- Journal of Mathematical Physics
- Journal of Physical & Chemical Reference Data
- Journal of Renewable & Sustainable Energy

- 저널별 Browse  
- 주요 아티클 소개

**AIP Publishing**

HOME BROWSE

### Recent Publications

**AIP Advances**  
Vol. 7, Issue 5, May 2017

**AIP Conference Proceedings**  
Vol. 1804, Issue 1, 27 January 2017

**APL Materials**  
Vol. 5, Issue 5, May 2017

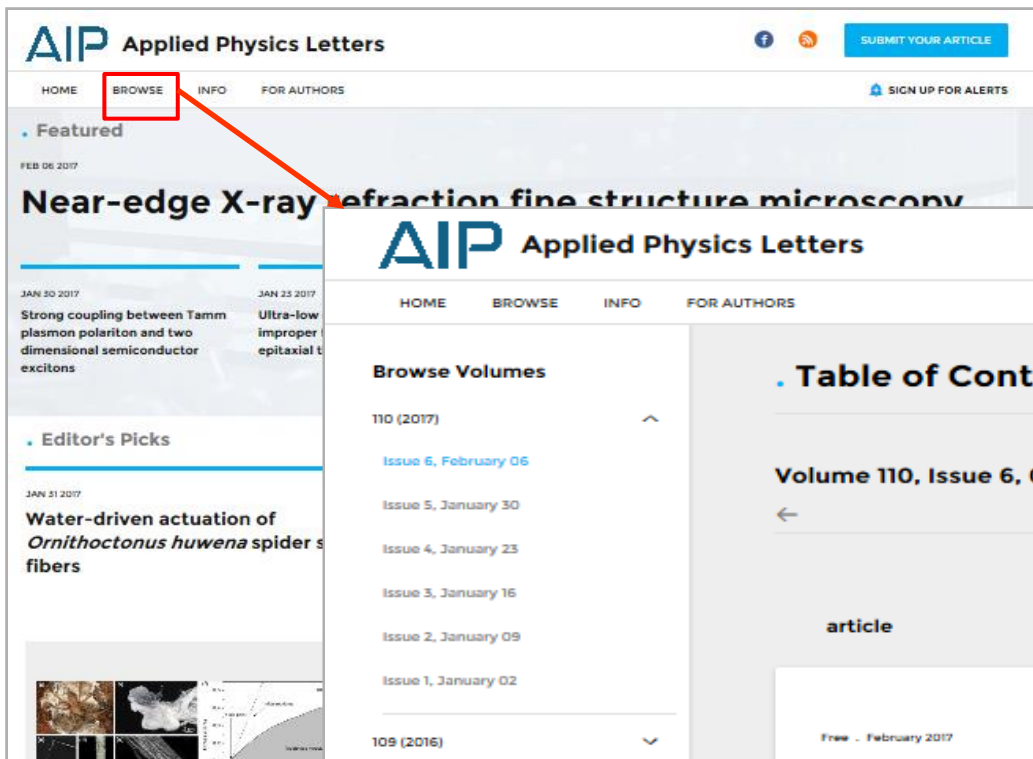
**APL Photonics**  
Vol. 2, Issue 3, March 2017

### Featured

- FEB 07 2017  
**Ultra-compact visible chiral spectrometer with meta-lenses**
- FEB 07 2017  
**Attosecond-controlled photoemission from metal nanowire tips in the few-electron regime**
- FEB 07 2017  
**Atomic clusters with addressable complexity**
- FEB 07 2017  
**Merging symmetry projection methods with coupled cluster theory: Lessons from the Lipkin model Hamiltonian**
- FEB 07 2017  
**Diffusion dominated evaporation in multicomponent lattice Boltzmann simulations**
- FEB 07 2017  
**Corresponding-states behavior of SPC/E-based modified (bent and hybrid) water models**

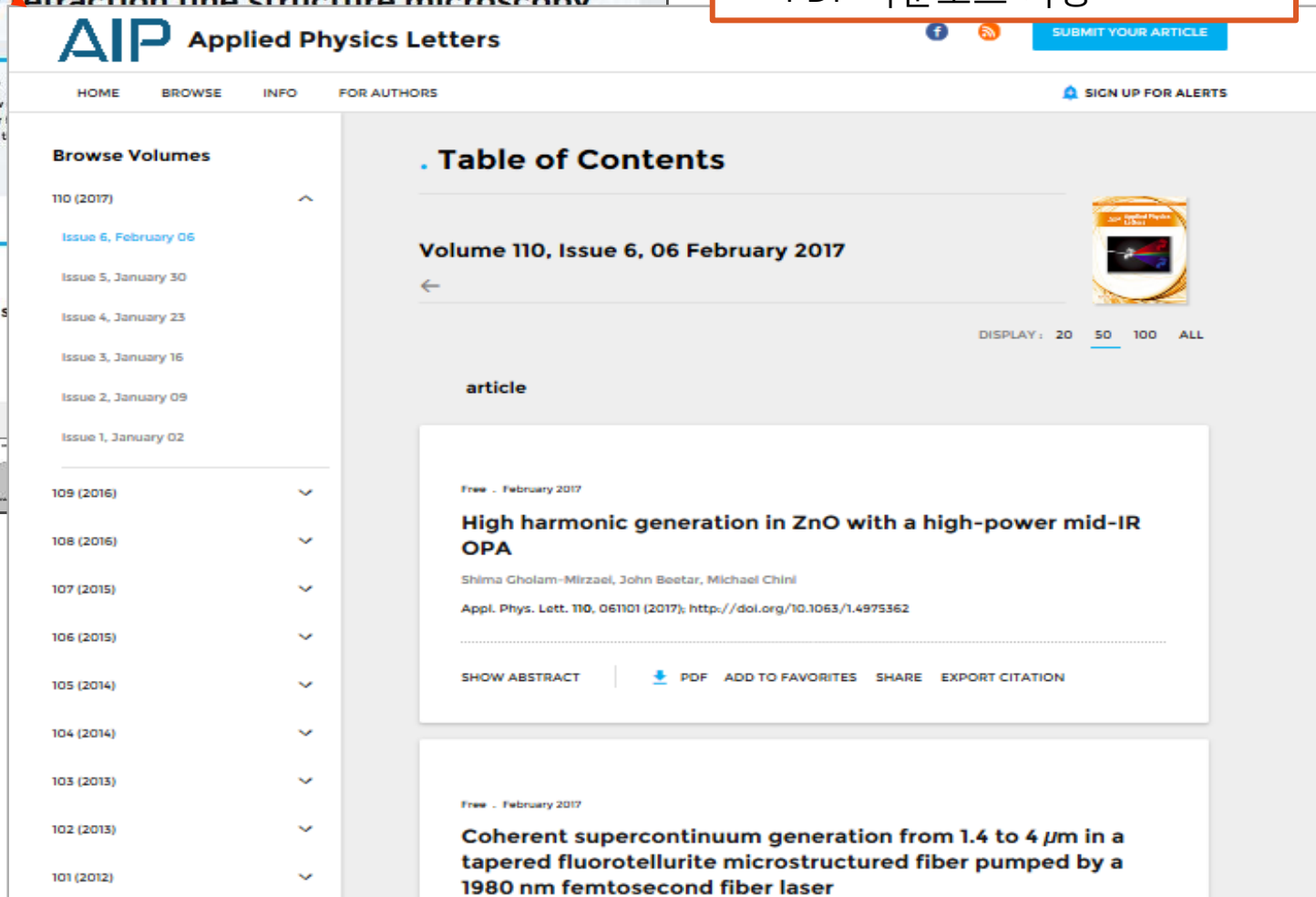
**저널별 webpage**

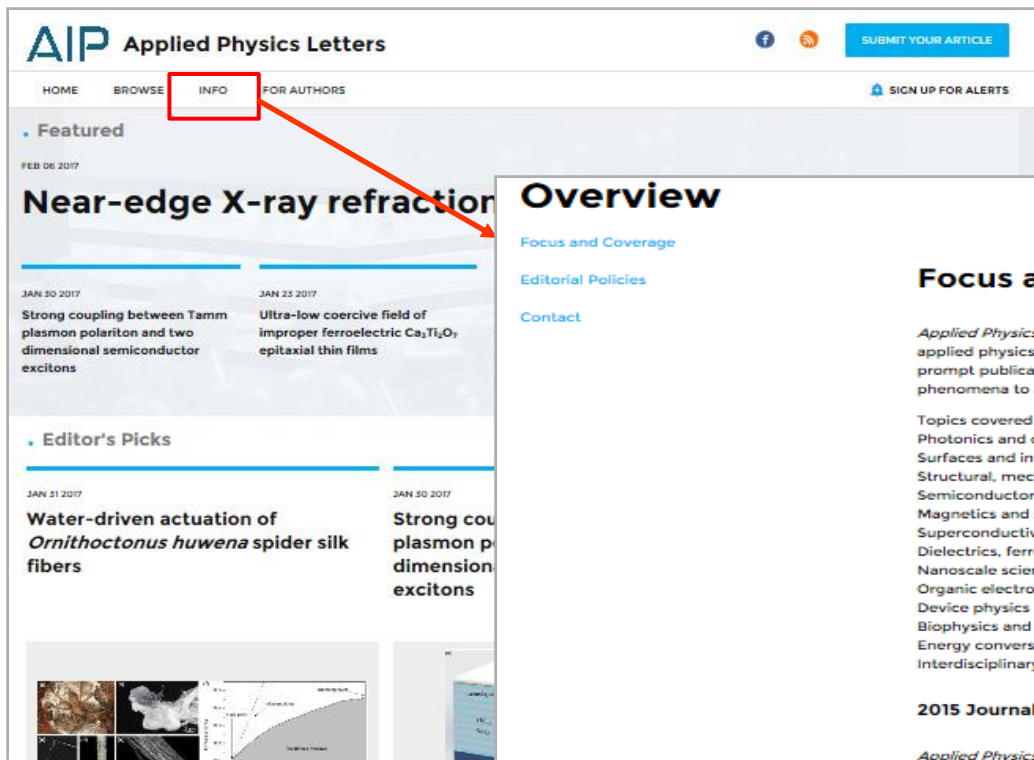
- 주요 아티클 소개
- 에디터 추천 아티클 소개
- 최근 아티클 소개



**BROWSE**

- Volume, Issue로  
브라우저하여 아티클 보기,  
PDF 다운로드 가능





**AIP Applied Physics Letters**

HOME BROWSE **INFO** FOR AUTHORS

SUBMIT YOUR ARTICLE

SIGN UP FOR ALERTS

Featured

FEB 06 2017

## Near-edge X-ray refraction

Overview

Focus and Coverage

Editorial Policies

Contact

JAN 20 2017  
Strong coupling between Tamm plasmon polariton and two dimensional semiconductor excitons

JAN 25 2017  
Ultra-low coercive field of improper ferroelectric  $\text{Ca}_2\text{Ti}_2\text{O}_7$  epitaxial thin films

Editor's Picks

JAN 31 2017  
Water-driven actuation of *Ornithoctonus huwena* spider silk fibers

JAN 30 2017  
Strong coupling between Tamm plasmon polariton and two dimensional semiconductor excitons

**INFO**

- 저널 특징, Coverage, JCR 및 Impact Factor 지수, ISSN 등의 정보 확인

## Overview

**Focus and Coverage**

*Applied Physics Letters* (APL) features concise, up-to-date reports on significant new findings in applied physics. Emphasizing rapid dissemination of key data and new physical insights, APL offers prompt publication of new experimental and theoretical papers reporting applications of physics phenomena to all branches of science, engineering, and modern technology.

Topics covered in APL are diverse and reflect the most important subjects in applied physics, including:

- Photonics and optoelectronics
- Surfaces and interfaces
- Structural, mechanical, optical, and thermodynamic properties of advanced materials
- Semiconductors
- Magnetics and spintronics
- Superconductivity and superconducting electronics
- Dielectrics, ferroelectrics, and multiferroics
- Nanoscale science and technology
- Organic electronics and photonics
- Device physics
- Biophysics and bio-inspired systems
- Energy conversion and storage
- Interdisciplinary and general physics

**2015 Journal Citation Reports® (Thomson Reuters, 2016)\*:**

*Applied Physics Letters* retains the top spot as the most highly cited journal in Applied Physics. (Thomson Reuters, 2015)

Five-Year Impact Factor	3.293
Impact Factor	3.142
Immediacy Index	0.673
Cited Half-Life	7.9
EigenFactor Score	0.38389
Article Influence Score	1.045



\* Data from the 2015 Journal Citation Reports® Science Edition (Thomson Reuters, 2016).

**ISSN**

The international standard serial number (ISSN) for *Applied Physics Letters* is 0003-6951 for the printed

AIP


Applied Physics Letters


SUBMIT YOUR ARTICLE

---

[HOME](#)   [BROWSE](#)   [INFO](#)   [FOR AUTHORS](#)

 [SIGN UP FOR ALERTS](#)

---

[Home](#) > [Applied Physics Letters](#) > [Volume 108, Issue 10](#) > [10.1063/1.4943204](#)
←   →    [Check for updates](#)

---

Published Online: March 2016 Accepted: January 2016

---


**Control of excitons in multi-layer van der Waals heterostructures**

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>2</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> [more...](#)
[View Affiliations](#)

---

DOI: <http://dx.doi.org/10.1063/1.4943204>

---

 [PDF](#)

[ABSTRACT](#)

[FULL TEXT](#)

[FIGURES](#)

[SUPPLEMENTAL](#)

[CITED BY](#)

[TOOLS](#)

[SHARE](#)   [METRICS](#)

---

[Trions](#) · [Photoluminescence](#) · [Materials properties](#) · [Polarization](#) · [Spin relaxation](#)

**ABSTRACT**


We report an experimental study of excitons in a double quantum well van der Waals heterostructure made of atomically thin layers of MoS<sub>2</sub> and hexagonal boron nitride. The emission of neutral and charged excitons is controlled by gate voltage, temperature, and both the helicity and the power of optical excitation.

**References**

1. A. K. Geim and I. V. Grigorieva, *Nature* **499**, 419 (2013).  
<https://doi.org/10.1038/nature12385> [Google Scholar](#)  
[CrossRef](#), [CAS](#)

---

2. A. Splendiani, L. Sun, Y. Zhang, T. Li, J. Kim, C.-Y. Chim, G. Galli, and F. Wang, *Nano Lett.* **10**, 1271 (2010).  
<https://doi.org/10.1021/nl903868w> [Google Scholar](#)  
[CrossRef](#), [CAS](#)



**ABSTRACT**  
- 초록, 참고문헌 보기

Confidential

15

©2018 Shinwondatanet co., Ltd.

**AIP Applied Physics Letters**

HOME BROWSE INFO FOR AUTHORS

Home > Applied Physics Letters > Volume 108, Issue 10 > 10.1063/1.4943204

Published Online: March 2016 Accepted: January 2016

## Control of excitons in multi-layer van der Waals heterostructure made of atomically thin boron nitride. The emission of neutral and charged excitons as a function of gate voltage, temperature, and both the heterostructure excitation.

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>1</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> more...

DOI: <http://dx.doi.org/10.1063/1.4943204>

PDF ABSTRACT FULL TEXT **FIGURES** SUPPLEMENTAL

Topics: Photoluminescence, Materials properties, Polarization, Spin relaxation

**ABSTRACT**

We report an experimental study of exciton transport in a coupled quantum well van der Waals heterostructure made of atomically thin boron nitride. The emission of neutral and charged excitons as a function of gate voltage, temperature, and both the heterostructure excitation.

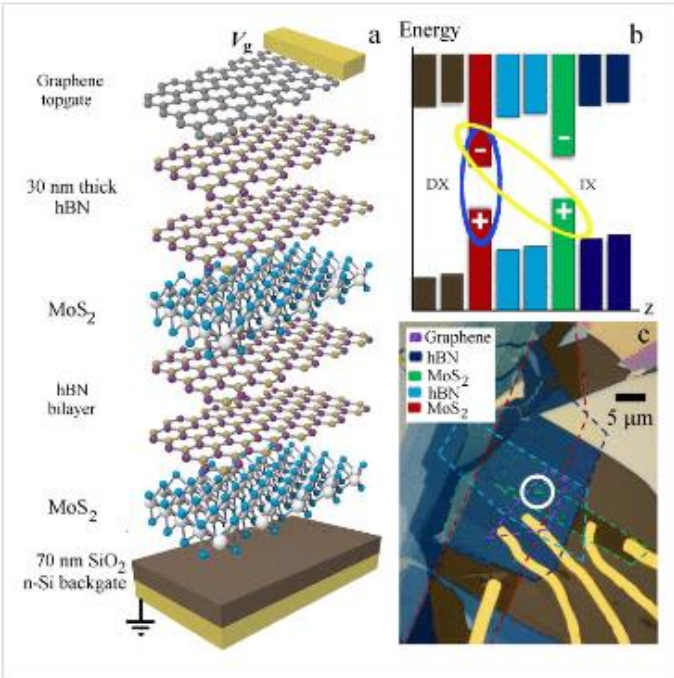
**References**

1. A. K. Geim and I. V. Grigorieva, Nature **439**, 981 (2010). <https://doi.org/10.1038/nature12385> [CrossRef](#), [CAS](#)
2. A. Splendiani, L. Sun, Y. Zhang, T. Li, J. Kim, G. Galli, and F. Wang, Nano Lett. **9**, 676 (2009). <https://doi.org/10.1021/nl903868w> [CrossRef](#), [CAS](#)

Citation: Appl. Phys. Lett. **108**, 101901 (2016); doi: <http://dx.doi.org/10.1063/1.4943204>

PDF ABSTRACT FULL TEXT **FIGURES** SUPPLEMENTAL CITED BY TOOLS SHARE METRICS

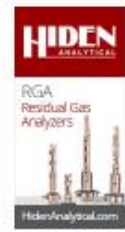
Topics: Photoluminescence, Materials properties, Polarization, Spin relaxation



**FIGURES**

아티클에 포함된 이미지를 PPT 및 고해상도 이미지로 다운로드 가능

[PPT](#) | [High-resolution](#)







**AIP Applied Physics Letters**

HOME BROWSE INFO FOR AUTHORS

Home > Applied Physics Letters > Volume 106, Issue 10 > 10.1063/1.4943204

Published Online: March 2016 Accepted: January 2016

## Control of excitons in multi-layer van der Waals heterostructures

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>1</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> more... [View Affiliations](#)

DOI: <http://dx.doi.org/10.1063/1.4943204>

PDF ABSTRACT FULL TEXT FIGURES **SUPPLEMENTAL** CITED BY TOOLS SHARE METRICS

Trions · Photoluminescence · Materials properties · Polarization · Spin relaxation

**ABSTRACT**

Full Published Online: March 2016 Accepted: January 2016

## Control of excitons in multi-layer van der Waals heterostructures

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>1</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> more... [View Affiliations](#)

DOI: <http://dx.doi.org/10.1063/1.4943204>

1. PDF ABSTRACT FULL TEXT FIGURES **SUPPLEMENTAL** CITED BY TOOLS SHARE METRICS

Trions · Photoluminescence · Materials properties · Polarization · Spin relaxation

2. [apl\\_format\\_supporting.pdf \(264 KB\)](#)

CrossRef, CAS

## SUPPLEMENTAL

- 해당 아티클과 관련한 추가 아티클 보기
- 추가 아티클을 PDF 파일로 다운 가능

Supporting materials for “Control of excitons in multi-layer van der Waals heterostructures”

E. V. Calman,\* C. J. Dorow, M. M. Fogler, and L. V. Butov  
Department of Physics, University of California at San Diego, La Jolla, CA 92093-0319, USA

S. Hu, A. Mishchenko, and A. K. Geim  
School of Physics and Astronomy, University of Manchester, Manchester M13 9PL, UK  
(Dated: January 14, 2016)

TABLE I. Material parameters of the layers.

Layer	$\epsilon^{\perp}$	$\epsilon^{\parallel}$	$\epsilon$	$\kappa$
hBN	6.71	3.56	4.89	1.37
MoS <sub>2</sub>	14.29	6.87	9.91	1.44
SiO <sub>2</sub>	3.90	3.90	3.90	1.00

**I. EFFECTIVE INTRALAYER INTERACTION AND EXCITON BINDING ENERGY**

Here we consider how dielectric environment may affect the binding energy of excitons in a MoS<sub>2</sub> layer in the effective mass approximation. For estimating the binding energies of direct excitons residing in a given MoS<sub>2</sub> layer, we consider a model [1] in which the system consisting of only three layers, labeled top to bottom as  $j = 0, 1$ , and 2. We treat the MoS<sub>2</sub> layer, which is  $j = 1$ , as a slab of thickness  $c = 0.312$  nm. The adjacent layers  $j = 0, 2$  are assumed to be semi-infinite, see Figure S1(a). All these materials are uniaxial dielectrics with principal values  $\epsilon_j^{\perp}$  and  $\epsilon_j^{\parallel}$  of the dielectric tensors in the directions perpendicular and parallel to the  $z$ -axis, respec-

of the single-particle wavefunctions of the two particles. The solution of the first problem and its implications for the exciton properties was previously discussed by Keldysh [4] for the case of isotropic media,  $\epsilon_j = 1$ . Recently, Zhang et al. [1] extended his analysis to the uniaxial anisotropy case. We employ an alternative representation of the same potential using the method of images. This representation is more computationally efficient for our simplified calculation in which the Pauli blocking effects [1] are neglected. We write the interaction  $V$  of the unit point charges in the form

$$V(r, z, z') = \frac{1}{\epsilon_1 \sqrt{r^2 + (z - z')^2 \kappa_1^2}} + V_1, \quad (1)$$

where the leading term represents the “direct” interaction and  $V_1$  is the image contribution:

$$V_1(r, z, z') = \sum_{n=0}^{\infty} (r_0 r_2)^n (r_0 A_n + r_2 B_n), \quad (2)$$

$$A_n = \frac{r_2}{\sqrt{r^2 + [(2n + 2)c + z - z']^2 \kappa_1^2}} + \frac{1}{\sqrt{r^2 + [(2n + 1)c - z - z']^2 \kappa_1^2}}, \quad (3)$$

## Control of excitons in multi-layer van der Waals heterostructures

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>3</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>4</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> [more...](#)

[View Affiliations](#)

DOI: <http://dx.doi.org/10.1063/1.4943204>

[PDF](#) [ABSTRACT](#) [FULL TEXT](#) [FIGURES](#) [SUPPLEMENTAL](#) **CITED BY** [TOOLS](#) [SHARE](#) [METRICS](#)

Trions · Photoluminescence · Materials properties · Polarization · Spin relaxation

### CITED BY

1. Chengbing Qin, Yan Gao, Zhibing Qiao, Liantuan Xiao, Suotang Jia. (2016) Atomic-Layered MoS<sub>2</sub> as a Tunable Optical Platform. *Advances of Optical Materials*

Online publication date: 9-Aug-2016.

[CrossRef](#)

2. V. Ongun Özçelik, Javad G. Azadani, Ce Yang, Steven J. Allen. (2012) Band structure and alignment of two-dimensional semiconductors for direct bandgap optoelectronics. *Physical Review B* **84**:3.



### CITED BY

- 선택한 아티클을 인용한 아티클 확인
- Author를 클릭하면 Author의 다른 아티클도 확인 가능

RESULTS: 5 of 5 Follow results: [+](#) [-](#)

Anywhere

ARTICLE TYPE

Research Article

Note

PUBLICATION DATE

2012  2015

TOPICS

Electronic Devices

Insulators

Bioelectrochemistry

Condensed Matter Electronic Structure

Electric Fields

MORE (27)

AUTHOR

Chen, Ruiyun

Jia, Suotang

Staimle, Timothy C.

Xiao, Liantuan

Zhang, Guofeng

ARTICLES (5)

Refine Search

SORT: [Relevance](#), [Date](#)

Full · Aug 21, 2012

**Optical Zeeman spectroscopy of the (0,0)  $B^{\ast}\Gamma - X^{\ast}\Phi$  band systems of titanium monohydride, TiH, and titanium monodeuteride, TiD**

Chengbing Qin, Colan Linton, Timothy C. Staimle  
The Journal of Chemical Physics **137**, 074301 (2012); <http://dx.doi.org/10.1063/1.4745557>

Full · Aug 7, 2012

**The permanent electric dipole moment and hyperfine interactions in platinum monofluoride, PtF**

Chengbing Qin, Ruohan Zhang, Fang Wang, Timothy C. Staimle  
The Journal of Chemical Physics **137**, 054309 (2012); <http://dx.doi.org/10.1063/1.4734596>

Full · Nov 28, 2012

**Note: Observation of a new electronically excited state of cobalt monoxide**

Jianzhong Zang, Qun Zhang, Chengbing Qin, Zhong Gu, Xilin Bai, Yang Chen  
The Journal of Chemical Physics **137**, 206101 (2012); <http://dx.doi.org/10.1063/1.4768871>

Full · Oct 15, 2014

**Electric field induced fluorescence hysteresis of single molecules in poly(methyl methacrylate)**

**Control of excitons in multi-layer van der Waals heterostructures**

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>2</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> [more...](#) [View Affiliations](#)

DOI: <http://dx.doi.org/10.1063/1.4943204>

PDF ABSTRACT FULL TEXT FIGURES SUPPLEMENTAL CITED BY **TOOLS** SHARE METRICS

Trions · Photoluminescence · Materials properties · Polarization · Spin relaxation

**CITED BY**

1. Chengbing Qin, Yan Gao, Zhibing Qiao, Liantuan Xiao, Suotang Jia. (2016) Atomic-Layered MoS<sub>2</sub> as a Tunable Optical Platform. *Advanced Optical Materials*

Online publication date: 9-A  
[CrossRef](#)

**HIDEN ANALYTICAL**  
Mass Spectrometers for Thin Films

## TOOLS

- **Download Citation**을 통해 다양한 format (RIS, EndNote, BibTex, Medlars, RefWorks)으로 다운로드 가능

**AIP AIP Publishing**

HOME BROWSE [SIGN UP FOR ALERTS](#)

If you have the appropriate software installed, you can download article citation data to the citation manager of your choice. Simply select your manager software from the list below and click on download.

For more information or tips please see 'Downloading to a citation manager' in the [Help menu](#).

**Include**

- Citation for this article
- References cited in this article
- Both article citation and reference list
- RIS (ProCite, Reference Manager)
- EndNote

**Format**

- BibTex
- Medlars
- RefWorks

**Direct import**

[Tips on citation download](#)

[Download article citation data](#)

Download article citation data for:

[Control of excitons in multi-layer van der Waals heterostructures](#)  
E. V. Calman<sup>1</sup>, C. J. Dorow<sup>2</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup>, and A. K. Geim<sup>2</sup> [View Affiliations](#)

Applied Physics Letters 2016 108:10

**Control of excitons in multi-layer van der Waals heterostructures**

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>1</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> [more...](#) [View Affiliations](#)

DOI: <http://dx.doi.org/10.1063/1.4943204>

PDF ABSTRACT FULL TEXT FIGURES SUPPLEMENTAL CITED BY **TOOLS** SHARE METRICS

Trilons · Photoluminescence · Materials properties · Polarization · Spin relaxation

Download Citation  
Add To Favorites  
Reprints And Permissions

**CITED BY**

1. Chengbing Qin, Yan Gao, Zhibing Qiao, Liantuan Xiao, Suotang Jia. (2016) Atomic-Layered MoS<sub>2</sub> as a Tunable Optical Platform. *Applied Physics Letters* 108, 071101. doi:10.1063/1.4943204  
Online publication date: 9/27/2016  
[CrossRef](#)

**AIP AIP Publishing**

HOME BROWSE [SIGN UP FOR ALERTS](#)

Personal Details  
Personal Licenses  
Redeem Activation Code  
Alerts  
**Favorites**  
Saved Searches  
Institution Licenses  
Usage reports

**FAVORITE ARTICLES**

Select an action Sort By: Article Title

Select all

Article Title	Publication	Publication date
<input type="checkbox"/> Control of excitons in multi-layer van der Waals heterostructures	<a href="#">Applied Physics Letters</a> Volume 108 Issue 10	07 Mar 2016
<input type="checkbox"/> Er-diffused Ti:LiNbO <sub>3</sub> waveguide laser of 1563 and 1576 nm emission wavelengths	<a href="#">Applied Physics Letters</a> Volume 61 Issue 11, pp. 1257-1259	04 Jun 1998

**TOOLS**  
- Add To Favorites을 통해 검색한 방식  
혹은 아티클 타이틀에 따라 이용자의  
계정에 즐겨 찾기 등록 가능

## Control of excitons in multi-layer van der Waals heterostructures

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>2</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> [more...](#)

[View Affiliations](#)

DOI: <http://dx.doi.org/10.1063/1.4943204>

[PDF](#) [ABSTRACT](#) [FULL TEXT](#) [FIGURES](#) [SUPPLEMENTAL](#) [CITED BY](#) [TOOLS](#) [SHARE](#) [METRICS](#)

Trilions · Photoluminescence · Materials properties · Polarization · Spin relaxation

- Download Citation
- Add To Favorites
- Reprints And Permissions

SHARE METRICS

- E-mail
- Facebook
- Linkedin
- Recommended To Librarians
- Twitter



Mass Spectrometers for Thin Films & Surface Engineering

### SHARE

- E-mail, Facebook, Linkedin, Twitter, 사서 선생님에게 추천 등의 방법으로 선택한 아티클 공유

## METRICS

- 해당 아티클의 View 및 인용된 수치를 도표로 확인

### Control of excitons in multi-layer van der Waals heterostructures

E. V. Calman<sup>1</sup>, C. J. Dorow<sup>1</sup>, M. M. Fogler<sup>1</sup>, L. V. Butov<sup>1</sup>, S. Hu<sup>2</sup>, A. Mishchenko<sup>2</sup> [more...](#)

[View Affiliations](#)

DOI: <http://dx.doi.org/10.1063/1.4943204>

[PDF](#)   [ABSTRACT](#)   [FULL TEXT](#)   [FIGURES](#)   [SUPPLEMENTAL](#)   [CITED BY](#)   [TOOLS](#)   [SHARE](#)   [METRICS](#)

[Trions](#) . [Photoluminescence](#) . [Materials properties](#) . [Polarization](#) . [Spin relaxation](#)

#### Article Metrics

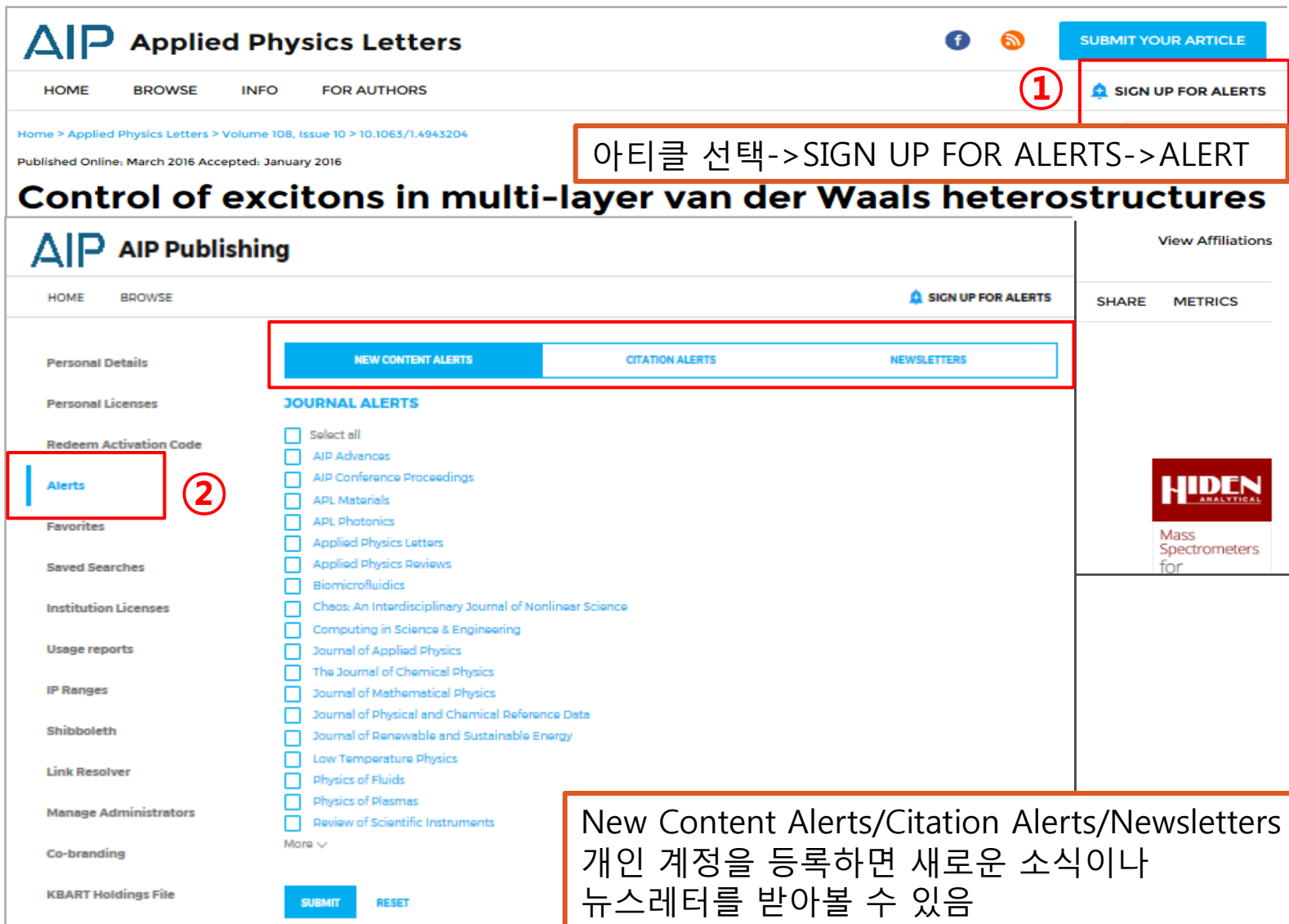
Views



Citations



Mass Spectrometers for



**AIP Applied Physics Letters**

HOME BROWSE INFO FOR AUTHORS

Home > Applied Physics Letters > Volume 108, Issue 10 > 10.1063/1.4943204

Published Online: March 2016 Accepted: January 2016

## Control of excitons in multi-layer van der Waals heterostructures

AIP AIP Publishing

HOME BROWSE

SIGN UP FOR ALERTS

View Affiliations

SHARE METRICS

Personal Details

Personal Licenses

Redeem Activation Code

Alerts

Favorites

Saved Searches

Institution Licenses

Usage reports

IP Ranges

Shibboleth

Link Resolver

Manage Administrators

Co-branding

KBART Holdings File

NEW CONTENT ALERTS CITATION ALERTS NEWSLETTERS

**JOURNAL ALERTS**

- Select all
- AIP Advances
- AIP Conference Proceedings
- APL Materials
- APL Photonics
- Applied Physics Letters
- Applied Physics Reviews
- Biomicrofluidics
- Chaos: An Interdisciplinary Journal of Nonlinear Science
- Computing in Science & Engineering
- Journal of Applied Physics
- The Journal of Chemical Physics
- Journal of Mathematical Physics
- Journal of Physical and Chemical Reference Data
- Journal of Renewable and Sustainable Energy
- Low Temperature Physics
- Physics of Fluids
- Physics of Plasmas
- Review of Scientific Instruments

More ▾

SUBMIT RESET

아티클 선택->SIGN UP FOR ALERTS->ALERT

New Content Alerts/Citation Alerts/Newsletters  
개인 계정을 등록하면 새로운 소식이나  
뉴스레터를 받아볼 수 있음



## 주의사항

AIP Full Text 를 과다 다운로드 하게 하게 되면 AIP Server에서는 과다 다운로드를 한 해당 PC가 속해있는 IP 대역의 C class가 모두 닫히게 됩니다. AIP에서는 해당 기관 담당자에게 위의 사실을 E- mail로 통보하며 닫힌 IP 대역을 해제하기 위하여, 해당 기관 담당자는 사유와 사후조치에 관한 내용을 담은 사유서 등을 출판사로 보내야 합니다.

AIP 이용자 분들께서는 과도한 Full Text 다운로드를 자제 해 주시고 꼭 필요한 Full Text만 다운로드 해주시기 바랍니다.



감사합니다.



신원데이터넷  
(<http://www.shinwon.co.kr>)

TEL 02-326-3535  
E-mail [info@shinwon.co.kr](mailto:info@shinwon.co.kr)