Introduction of SUZURI Lab

Prof. Yoshiyuki SUZURI
Vice-Director(INOEL)

Yamagata University,
Innovation Center for
Organic Electronics (INOEL)
E-mail suzuri@yz.Yamagata-u.ac.jp
http://inoel.yz.Yamagata-u.ac.jp/suzuri-lab/

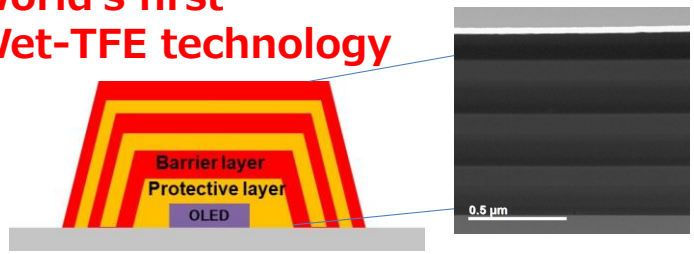
Next Generation Flexible Technology　Yamagata Univ. INOEL

[High barrier, Wet process, Flexible, OLEDs]　　**Prof. Yoshiyuki SUZURI**

Flexible and transparent OLED panel (200x50mm)

High barrier structure by wet process

World's first
Wet-TFE technology



High barrier structure
by Wet process
at Low temp.
on device

Condition
- **Under N2**
- **Room temp.**
- **VUV irradiation (λ<200nm)**

ACS Appl. Mater. & Interfaces, **46**, 43425 (2019)

Content: **Total research for flexible OLEDs**

OLED (Organic Light-Emitting Diode) finds applications not only in displays, but also in a wide range of industrial fields such as lighting, signage, and automobile, because of its unique features such as "flexibility" and "transparency". The key to the widespread use of OLEDs is the "innovative flexible technology" that provides flexible panels at low cost. Our laboratory is researching new technologies in addition to general technologies. We are focusing on (1) flexible panel technology, (2) wet coating process for cost reduction, and (3) demonstration of OLED systems to propose new applications. Large area panels (200 mm sq.) can be fabricated in our lab. Also, we can develop drive circuits for OLED panels.

Appealing point: **Wet processed high barrier structure**

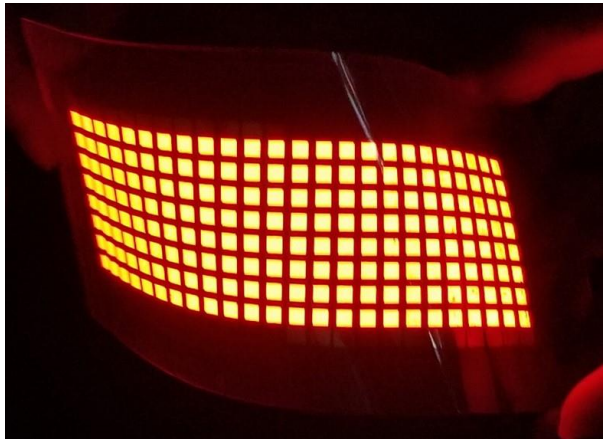
We have achieved the world's first high barrier by wet process on OLEDs. This is an innovative technology that can be used not only for OLEDs, but also for other devices and packages that need to be protected from water vapor .

ACS Appl. Mater. Interfaces (2019)　https://pubs.acs.org/doi/10.1021/acsami.9b14994
ACS Appl. Nano Mater. (2021)　https://pubs.acs.org/doi/10.1021/acsanm.1c01862

Yamagata University, Innovation Center for Organic Electronics (INOEL)
Vice-Director(INOEL), Prof., Ph.D.
Yoshiyuki SUZURI

E-mail : suzuri@yz.yamagata-u.ac.jp
Tel : +81-238-29-0577
Fax : +81-238-29-0569
HP : http://inoel.yz.yamagata-u.ac.jp/suzuri-lab/

SUZURI Lab's Technology



Thin Films
- Dry & Wet Fabrication
- Evaluation of films
- Device structure
- **Barrier structure**

Panels
- cleaning
- handling
- Processes

Device
- Electrical &
- Optical Meas.
- Durability test

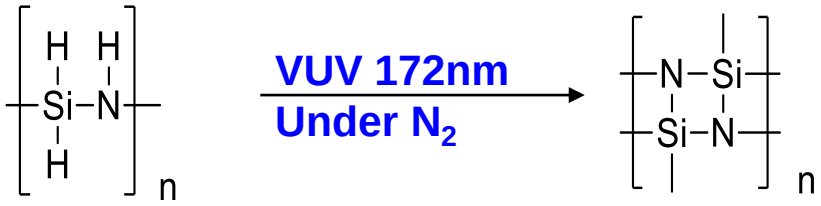
Design
- Drive circuits
- Panel design

The world first "wet high Barrier technology"

Flexible devices ; from basics to applications

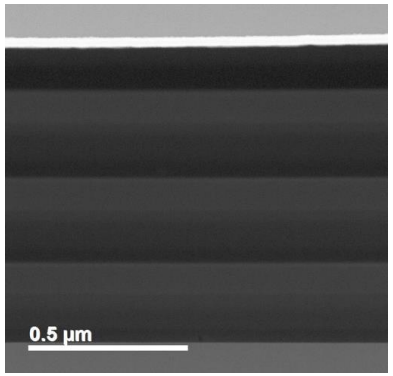
Our Original Tech. : The world first “Wet High Barrier”

Wet coating | **VUV light Irradiation**



Soluble SiN source
PHPS
(Perhydro-polysilazane)

SiN_x



TEM image of the barrier

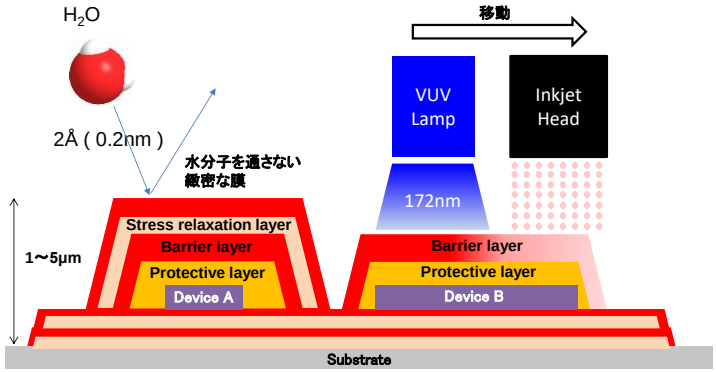
Flexible OLED with the barrier : R=5mm

Features

- **Under N_2 (inert atmosphere)**
- **Room temp.**
- **Vacuum ultraviolet light**
  (VUV : λ<200nm)

Succeeded in **SiN, SiO_2, ZnO, SnO_2, TiO_2**

Society5.0, Industry4.0
High barrier fabricated by IJ

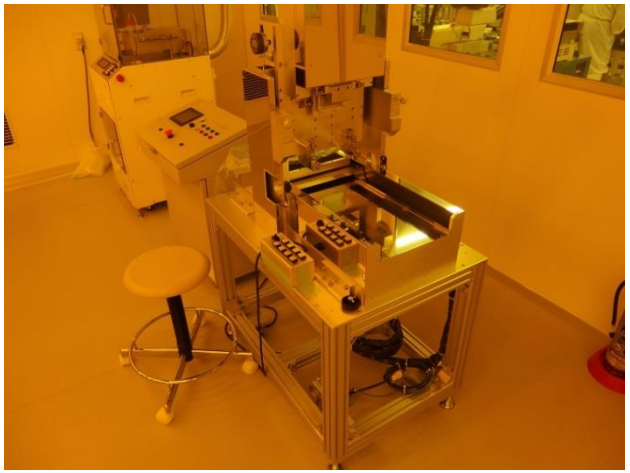


Our Articles

ACS Applied Nano Materials **4, 10,** 10344-10353 (2021)
ACS Applied Materials & Interfaces, **46**, 43425-4343（2019）
Journal of The Electrochemical Society, 166 (9) B3176-B3183 (2019)
Organic Electronics, 64, p176-180 (2019)

Fabrication System in Clean Room
Vacuum depo., Printing, Coating, Glovebox

Vacuum vapor depo., Spatter
Substrate ~200x200 mm



Slit die coater

Spray coater

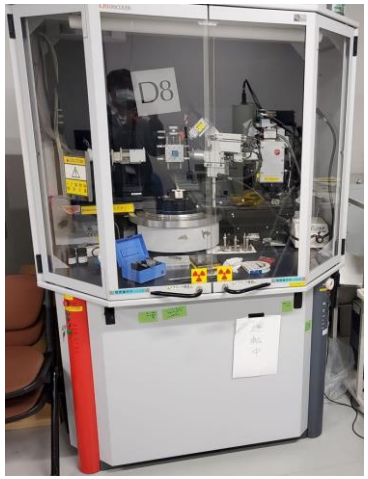
Glovebox

Screen printing

Clean room

Film Analysis

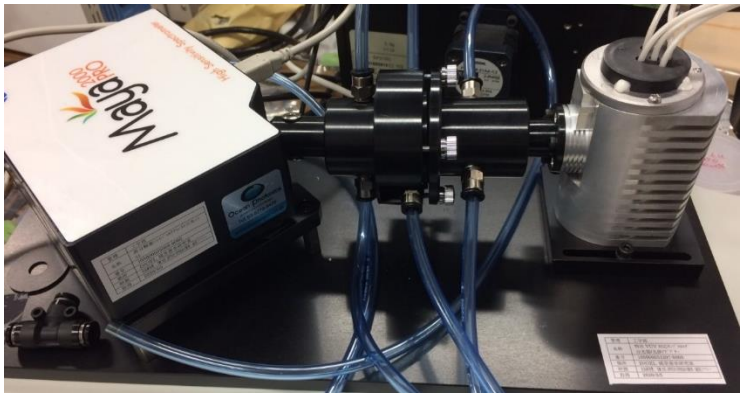
Spectroscopic ellipsometry



XRD/XRR

Optical film thickness distribution

FT-IR



VUV-absorption Spectra

SEM-EDX

Barrier related equipment

Gas & water vapor transmittance

Adhesion force

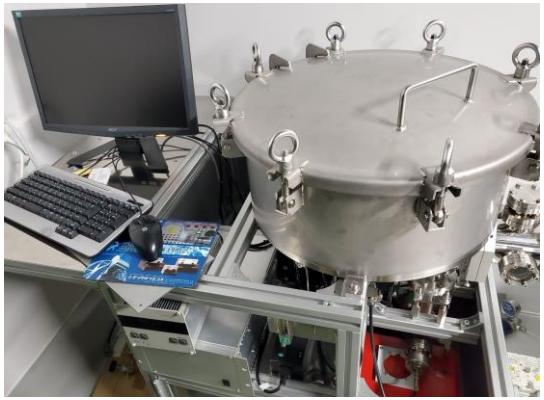
Glovebox

VUV irradiation system in glovebox

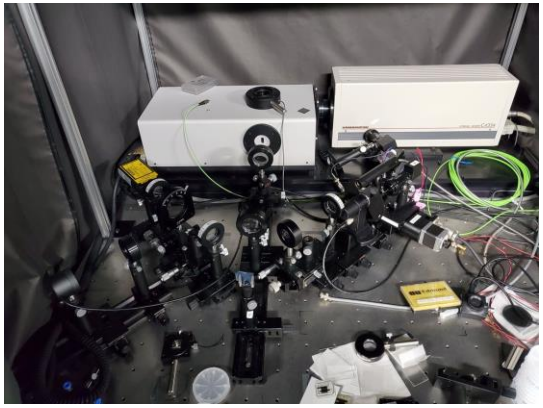
Ink-jet in glovebox

Contact angle measurement

Device Measurement & Film Analysis

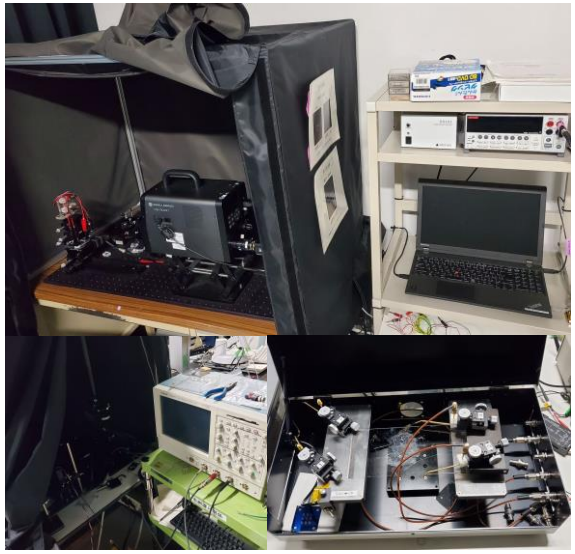


PYS（Ip）



Fluorescent lifetime

PLQY for films



Device performance

Storage test

Continuous driving test for OLEDs