AH Materials

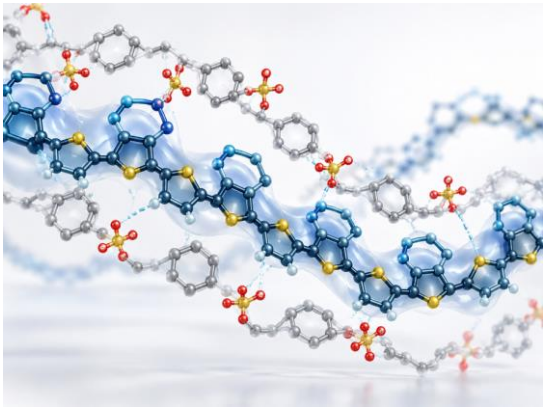
Advanced Hybrid Materials

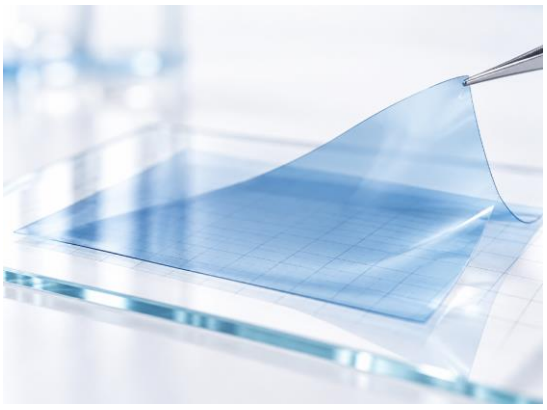
PRODUCT CATALOG

CONDUCTIVE POLYMERS · HYBRID MATERIALS

Materials for flexible and stretchable electronics

PEDOT:PSS formulations, nanowires, additives and hybrid solutions, developed from research at Pukyong National University.





- Hole & electron injection materials
- PEDOT nanowires & powders
- Cellulose/PEDOT:PSS hybrids
- Transparent & stretchable electrodes
- Process additives & surface modifiers
- Ion gels for electrochromics

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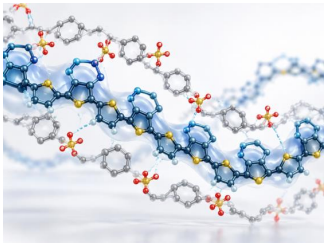
Functional hybrid materials

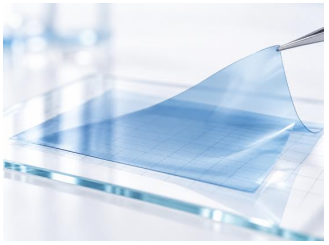
We offer low-cost, high-performance polymer/nano-metal hybrid solutions. With our products you can build highly flexible, stretchable and conductive transparent electrodes, sensors and EMI-shielding films.

They support next-generation flexible and stretchable devices: organic solar cells, OLEDs, perovskite devices, sensors, heaters and EMI-shielding devices.

Conducting polymer & metal hybrid materials



Semi-metallic conducting polymers



Transparent electrodes, EMI shielding, heaters, healthcare sensors

Stretchable electronics

PRODUCT LINEUP

Product	Model	Key property	Page
High-φ PEDOT:PSS	AH-PH · PHA · PHB · PH-S	Work function 5.3 to >5.7 eV	03
Highly conductive PEDOT:PSS	AH-PTE0	~80 Ω/sq (post-treated), ~90 % transmittance	04
Stretchable conductive PEDOT:PSS	AH-PTE1 · PTE-S	~80 Ω/sq (post-treated), ~90 %, highly stretchable	04
PEDOT nanowire	AH-PNW	~1 Ω/sq, high thermal stability	05
PEDOT & PEDOT:PSS powders	AH-PP-N · PP-F · PP-O	Conductive binders for batteries	05
Conductivity & stretch enhancer	AH-CSE100	Additive for PEDOT:PSS solutions	06
Surface modifiers	AH-A1 – A4	Adhesion on glass, PET, PDMS	06
Cellulose/PEDOT:PSS hybrid	AH-CEPT	Ultralow hysteresis, ~190 %, recyclable	07
Electron injection materials	AH-EIM1 · EIM2	Work function 3.96 / 4.1 eV	08
Ion gel for electrochromics	EC-GEL1	Ionic conductivity ~1.16 mS/cm	09

High-φ PEDOT:PSS

AH-PH | AH-PHA | AH-PHB | AH-PH-S · stretchable grade

Water-based PEDOT:PSS with an exceptionally **high work function**, for efficient **hole injection** in organic, perovskite and stretchable devices.

APPLICATIONS

Hole injection layers for organic and stretchable electronics, displays and solar cells

FEATURES

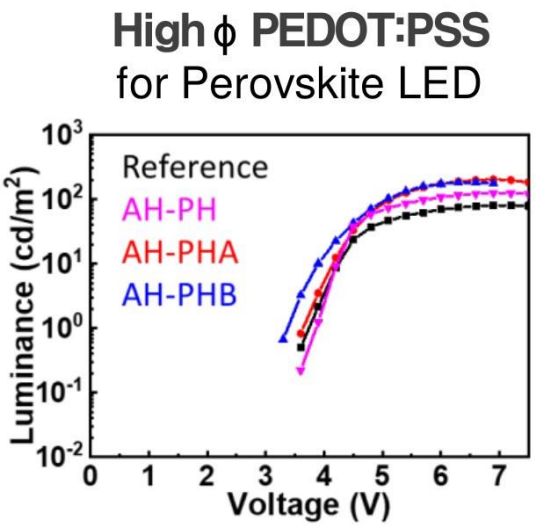
- Coats glass, PET, PEN and more
- Excellent processability
- Exceptionally high work function

PROPERTIES

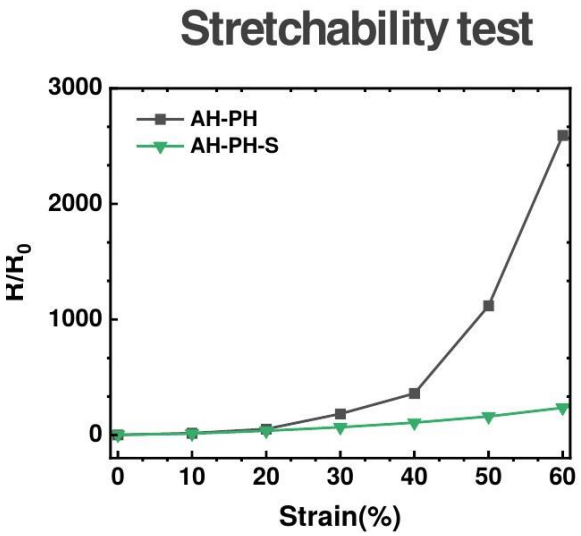
Property	Unit	AH-PH	AH-PHA	AH-PHB
Work function	eV	5.3–5.4	> 5.4	**> 5.7**
Conductivity	S/cm	~10^{-3}	~10^{-3}	~10^{-3}
Solvent	–	Water	Water	Water
Appearance	–	Dark blue	Dark blue	Dark blue

Reference PEDOT:PSS (Company H): ~5.0 eV

PERFORMANCE



Luminance–voltage curves of perovskite LEDs using each grade as the hole injection layer



Resistance change under strain: AH-PH vs. the stretchable grade AH-PH-S

Perovskite LED	Reference	AH-PH	AH-PHA	AH-PHB
Max. luminance, cd/m² (at V)	80 (7.2)	124 (6.9)	**202 (6.9)**	181 (6.3)
Max. luminous efficiency, cd/A	2.74	3.05	3.55	**5.48**

Highly conductive PEDOT:PSS

AH-PTE0 | AH-PTE1 · stretchable | AH-PTE-S · homogeneous grade

Water-based PEDOT:PSS for coated **transparent electrodes** with low sheet resistance and ~90 % transmittance. AH-PTE1 adds high stretchability; AH-PTE-S is a more homogeneous grade of AH-PTE1.

APPLICATIONS

Transparent electrodes for organic and stretchable electronics, displays and solar cells

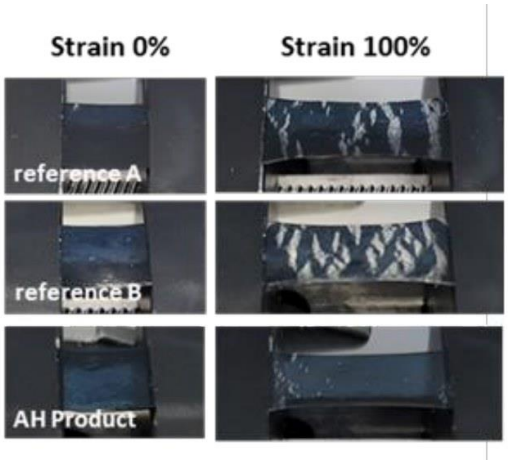
FEATURES

- Coats glass, PET, PEN and more
- Excellent processability
- Low sheet resistance, high transmittance

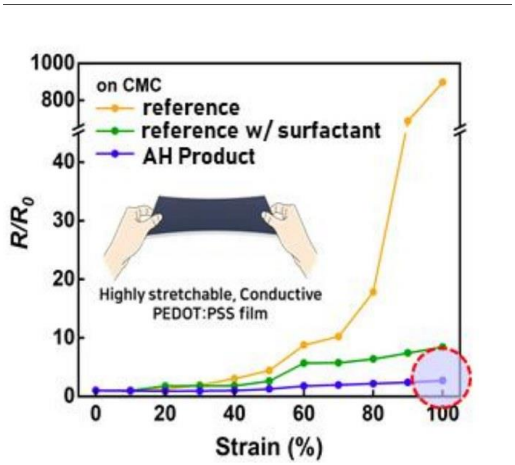
PROPERTIES

Property	Unit	AH-PTE0	AH-PTE1
Sheet resistance, without post-treatment	Ω/sq	~130	~130
Sheet resistance, with post-treatment	Ω/sq	**~80**	**~80**
Transmittance	%	~90	~90
Stretchability	–	–	High
Solvent	–	Water	Water
Appearance	–	Dark blue	Dark blue

STRETCHABILITY OF AH-PTE1



Films at 0 % and 100 % strain: references A, B vs. AH product



R/R_0 vs. strain on CMC substrate

At 100 % strain the AH product stays near its initial resistance, while reference films crack.

PEDOT nanowire

AH-PNW

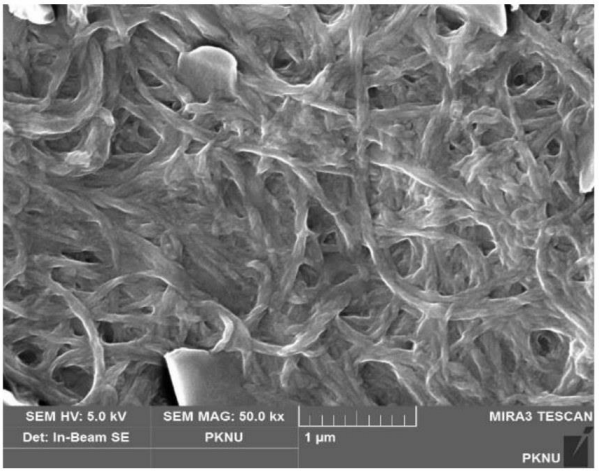
APPLICATIONS

Electrodes for organic and **stretchable electronics, batteries and supercapacitors**

FEATURES

- Coats glass, PET, PEN and more
- Excellent processability
- Low sheet resistance
- High thermal stability

Property	Unit	AH-PNW
Sheet resistance	Ω/sq	**~1** (1 ml, 2×2 cm²)
Solvent	–	Methanol



SEM image of AH-PNW (scale bar: 1 µm)

PEDOT & PEDOT:PSS powders

AH-PP-N · PEDOT | AH-PP-F · PEDOT:PSS | AH-PP-O · PEDOT:PSS

APPLICATIONS

Conductive binders for secondary batteries

FEATURES

- Excellent processability
- Low sheet resistance
- High thermal stability

AH-PP-F

AH-PP-O

Conductivity & stretchability enhancer

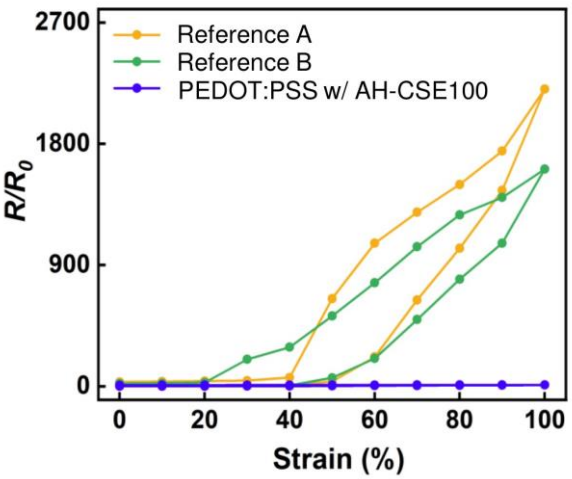
AH-CSE100

HOW IT WORKS

Add AH-CSE100 to aqueous PEDOT:PSS solutions to **raise both conductivity and stretchability**. No other process change is needed.

RESULT

With AH-CSE100, R/R_0 stays near 1 up to 100 % strain, while reference films rise above 1,500.



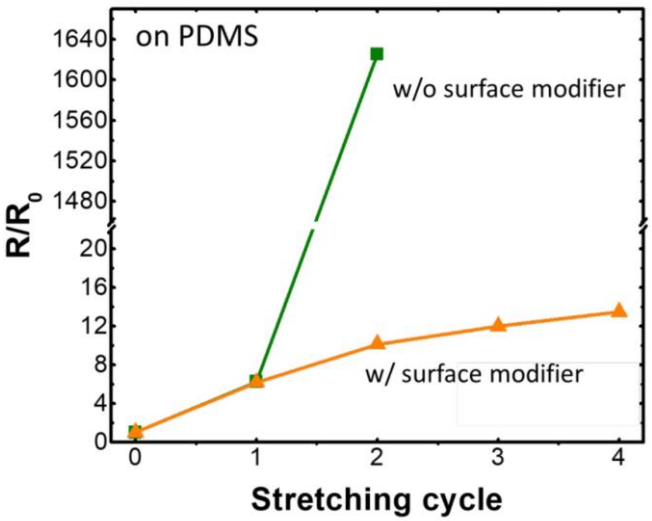
R/R_0 under strain: PEDOT:PSS with AH-CSE100 vs. references A and B

Surface modifiers

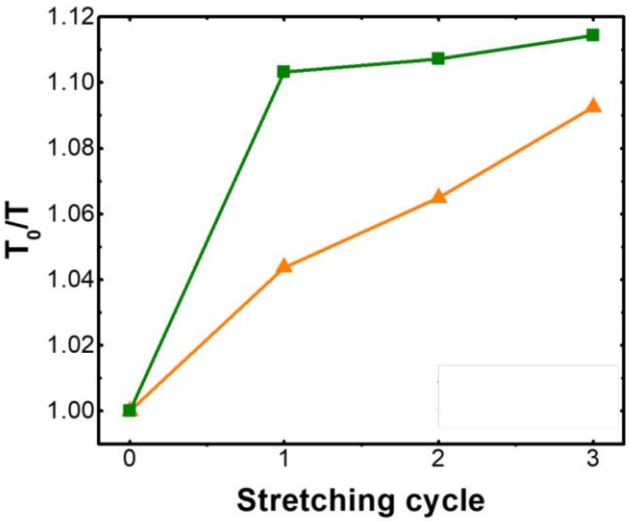
AH-A1 AH-A2 AH-A3 AH-A4

Improve wettability, adhesion and bonding strength between coating solutions (PEDOT:PSS or AgNW) and substrates such as glass, PET and PDMS.

Without surface modifier With surface modifier



Resistance change (R/R_0) over stretching cycles on PDMS



Transmittance change (T_0/T) over stretching cycles

Cellulose/PEDOT:PSS hybrid solution

AH-CEPT

A **recyclable cellulose/PEDOT:PSS composite** with ultralow electrical hysteresis, for stretchable sensors and electronics.

Used films are dissolved, degassed and re-cast

< 2.6 %
degree of hysteresis at 50 % strain

~190 %
stretchability

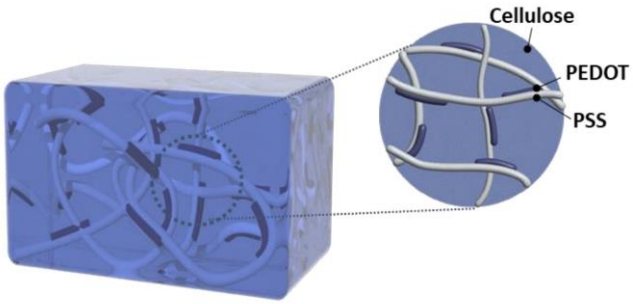
Recyclable
and reusable

APPLICATIONS

Cellulose/PEDOT:PSS composites for organic and stretchable electronics

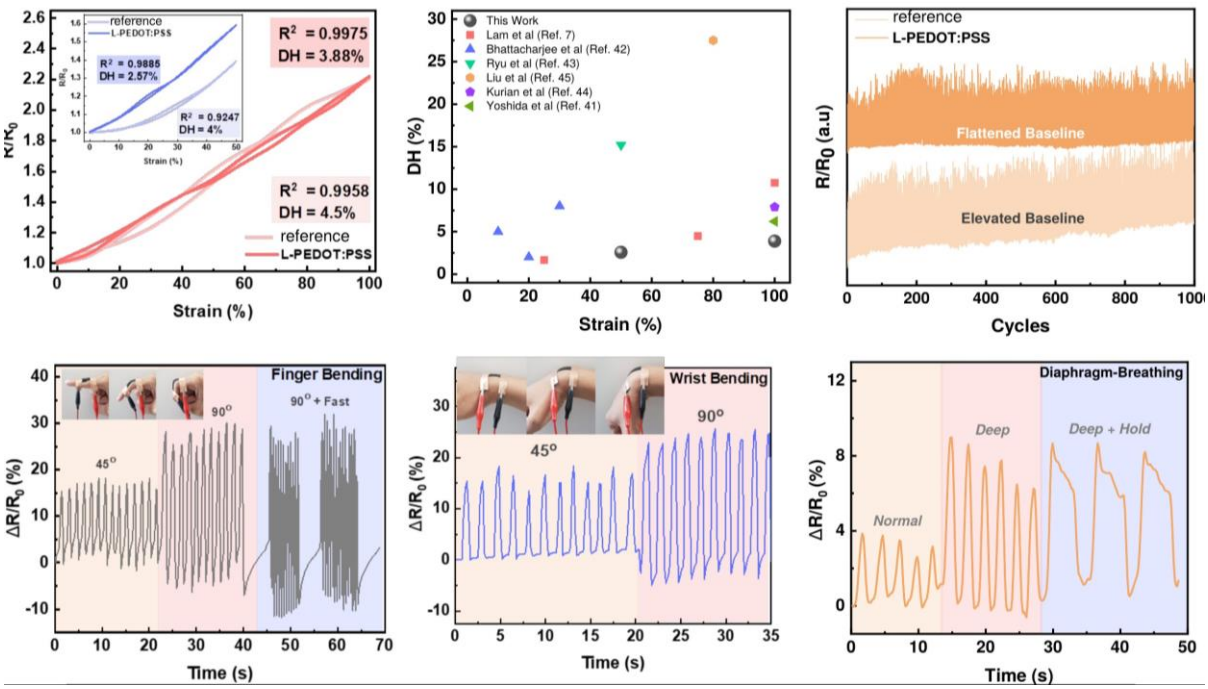
FEATURES

- Excellent processability
- Ultralow hysteresis, high stretchability
- Recyclable and reusable



Cellulose network interwoven with PEDOT and PSS

CHARACTERISTICS



Top: R/R_0 hysteresis under strain, degree of hysteresis vs. reported stretchable conductors, and 1,000-cycle stability. Bottom: real-time sensing of finger bending, wrist bending and breathing.

Electron injection materials

AH-EIM1 AH-EIM2

Low-work-function interlayers for efficient **electron injection** in organic and flexible devices.

APPLICATIONS

Electron injection layers for organic and stretchable electronics

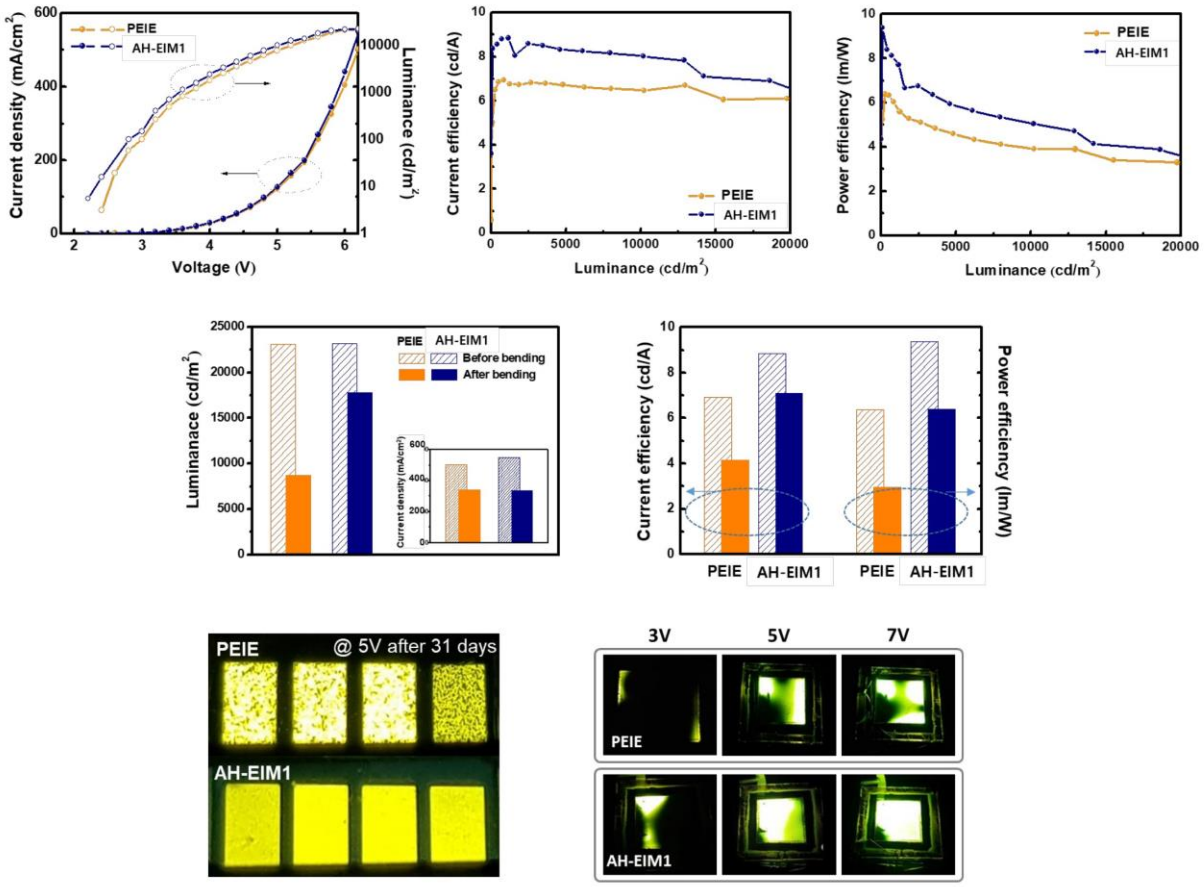
FEATURES

- Excellent processability
- Low work function
- Outstanding electron injection

PROPERTIES

Property	Unit	AH-EIM1	AH-EIM2
Work function	eV	**3.96**	**4.1**

AH-EIM1 IN FLEXIBLE OLEDS, COMPARED WITH PEIE



Top: current density–voltage–luminance, current efficiency and power efficiency. Middle: luminance and efficiency before and after bending. Bottom: emission after 31 days at 5 V, and at 3, 5 and 7 V.

Ion gel for electrochromic devices

EC-GEL1

APPLICATIONS

Ion gel electrolytes for electrochromic devices

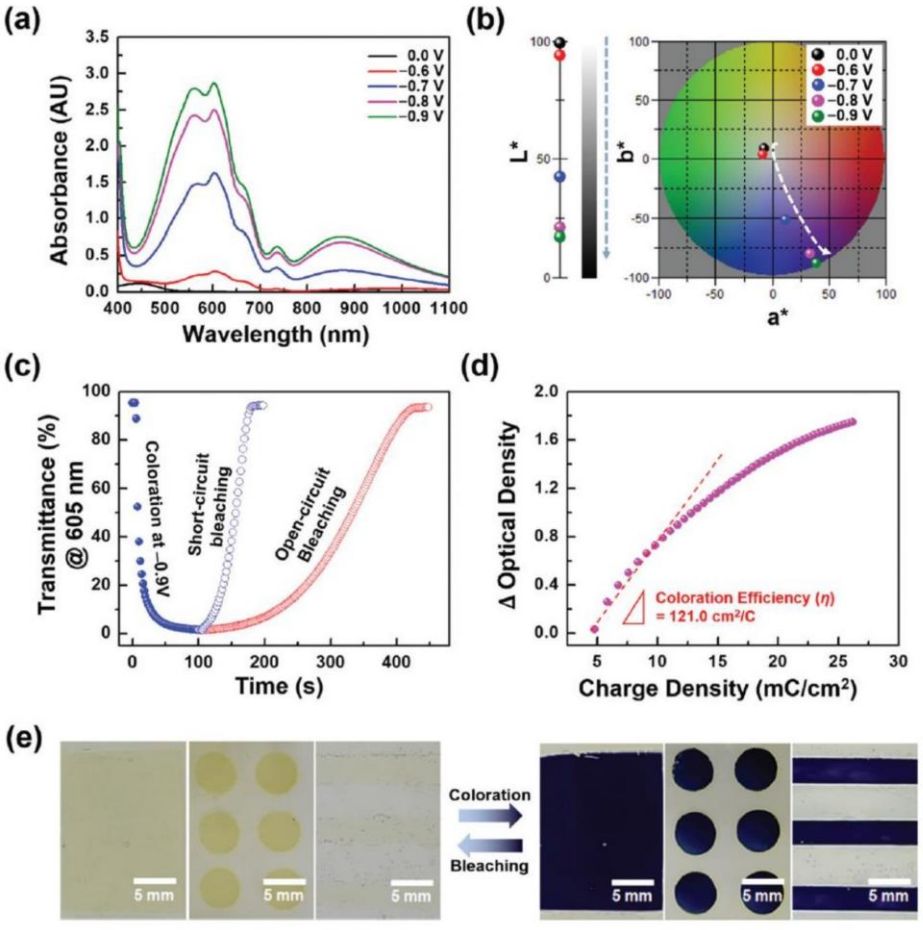
FEATURES

- Excellent processability
- High elastic modulus
- High ionic conductivity

PROPERTIES

Property	Unit	EC-GEL1
Elastic modulus	Pa	~2.20 × 10⁵
Ionic conductivity	mS/cm	**~1.16**
Coloration efficiency (in device)	cm²/C	121.0

CHARACTERISTICS



(a) Absorbance and (b) color coordinates at applied voltages; (c) transmittance at 605 nm during coloration and bleaching; (d) coloration efficiency; (e) patterned devices before and after coloration. Ref.: J. Mater. Chem. C 2020, 8, 17045.

CONTACT

Samples & inquiries

For samples, quotations and technical data, tell us your application and the specifications you need.

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ABOUT US

AH Materials is a faculty start-up of Pukyong National University, built on research from the Organic Semiconductor Materials & Devices Lab (Prof. Yong Hyun Kim).

AH Materials

Advanced Hybrid Materials

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