(양식 1)

【 고분자학회 학회상 포상 지원서 】

[표지]

<table>
<tr><td>공모분야</td><td colspan="5">권순기우수학위논문상</td></tr>
<tr><td rowspan="4">지원자
인적사항</td><td rowspan="2">성 명</td><td>한 글</td><td>박해찬</td><td rowspan="2">영 문</td><td rowspan="2">Haechan Park</td></tr>
<tr><td>한 자</td><td>朴海瓚</td></tr>
<tr><td rowspan="3">소속기관</td><td>기관명</td><td colspan="3">울산과학기술원 (UNIST)</td></tr>
<tr><td>부서명
(학과명)</td><td>자연과학대학
화학과</td><td>직위/직급</td><td>박사후 연구원</td></tr>
<tr><td>주 소</td><td colspan="3">울산광역시 울주군 언양읍 유니스트길 50</td></tr>
<tr><td>업적요지</td><td colspan="5">학위 과정 동안 유기 고분자와 화학적·전자공학적 지식을 바탕으로 재활용 가능한 유기 전자소자 및 차세대 유기 전자기기를 개발하는 연구를 수행하였음. 고분자 반도체, 고분자 전도체, 탄성체 등 다양한 고분자 재료를 활용하여 새로운 응용 가능성을 제시하고 이를 실현함으로써 학계에 새로운 연구 방향과 관점을 제시하는 데 기여함.
특히, 재활용 가능한 유연 전자기기 연구는 환경 지속 가능성 측면에서 전자재료 분야에 중요한 패러다임 전환을 이끌며 Nature Electronics에 게재되어 학계에 큰 영향을 공여함. 또한, 탄성체의 표면 주름 제어를 통한 인공 지문 기술은 생체 모방형 소자의 새로운 가능성을 열며 Nature Communications에 게재되어 학문적·기술적 확장을 이룸.
학위 과정 동안 Chemical Communications, npj Flexible Electronics, Journal of Materials Chemistry C 등 다수의 국제 저명 학술지에 제1저자 논문을 게재하였으며, 이는 고분자 기반 유기 전자소자 개발에 중점적으로 기여함. 새로운 소재 설계와 응용을 통해 고분자 과학 및 공학 분야의 발전에 공여함.
또한, 2023년 이후 꾸준히 한국고분자학회 학술대회에 참여하여 학문 공동체와의 교류에 기여하였으며, 2024년에는 포스터상을 수상하여 연구 성과의 우수성을 학회 차원에서도 인정받음. 현재도 다양한 고분자 기반 혁신 연구를 수행하며, 고분자 과학 및 공학 분야의 미래 발전에 기여하고 있음.</td></tr>
<tr><td colspan="6">상기와 같이 고분자학회 학회상 포상을 지원합니다.

2025. 08. 26
기관명 : 울산과학기술원
직 위 : 박사후 연구원
지원자 : 박해찬 (서명)</td></tr>
</table>

(양식 2)

1. 인적사항

가. 학력사항 (대학교 이상만 기재)

기 간	학 교 명	전공 및 학위, 지도교수
2017.03 - 2021.02	건국대학교	화학과 (이학학사)
2021.03 - 2025.08	울산과학기술원	화학과 (이학박사), 심교승

나. 경력사항 (5개 이내 기재)

기 간	기관명(직위, 직책 등)
2025.08 – 진행 중	울산과학기술원 (박사후 연구원)

다. 수상경력 (최근 3년 이내)

※ 정부 포상, 민간 포상 등 연구개발 업적 관련 수상경력 모두 기재

일 자	수 상 내 용	시 상 기 관
2025.01.21	우수발표상 (poster presentation)	한국정보디스플레이학회
2024.04.04	우수발표상 (poster presentation)	한국 고분자학회
2024.02.07	Silver prize (졸업생 우수 연구 발표회)	UNIST 화학과
2023.11.16	우수발표상 (oral presentation)	한국 접착 및 계면학회

4. 연구개발 실적

(3) 총괄연구업적 목록

□ 학술지 논문 - SCIE 등재지에 한함

제 목	발표지명	Impact factor	발표년도	역할(저자)	저자수(명)	피인용 횟수
Irreproducible SEBS wrinkling based on spin evaporation enabling identifiable artificial finger pad electronics	Nature Communications	15.7	2025	주저자	6	1
Facile strategy for uniform gold coating on silver nanowires embedded PDMS for soft electronics	npj Flexible Electronics	15.5	2024	주저자	10	3
Chemically and physically enhanced adhesion for robust interfaces in all-soft vertical organic photodetectors	Chemical Communications	4.2	2024	주저자	6	0
Organic flexible electronics with closed-loop recycling for sustainable wearable technology	Nature Electronics	40.9	2024	주저자	7	92
Skin-friendly soft strain sensor with direct skin adhesion enabled by non-toxic surfactant	Journal of Materials Chemistry C	5.1	2023	주저자	8	12
Soft Schottky diodes for skin-interfaced electronics enabled by entirely soft components	Soft Science	9.0	2024	공동저자	7	6
Fully soft organic electrochemical transistor enabling direct skin-mountable electrophysiological signal amplification	Chemical Communications	4.2	2022	공동저자	4	16

□ **등록**된 국내외 특허

제 목	등록번호	등록년도	등록처	역할
-	-	-	-	-

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Article

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Irreproducible SEBS wrinkling based on spin evaporation enabling identifiable artificial finger pad electronics

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Juyeong Lee[1,5], Haechan Park[1,5], Sehyun Kim[1], Chang Liu[2], Zhengwei Li[2,3] & Kyoseung Sim[1,4]

Irreproducible wrinkling, characterized by randomly arranged ridges or creases on material surfaces, has significant potential for application in entity identification and anti-counterfeiting. However, active research in this field is hindered because the existing wrinkling methods face challenges in realizing discernible patterns and potential applications of submillimeter-scale wavelength wrinkles are yet to be identified. Herein, we propose a strategy to create unique and irreproducible styrene–ethylene–butylene–styrene (SEBS) wrinkles using "spin evaporation", a technique that rapidly removes the solvent by spinning. We demonstrate the realization of SEBS wrinkles with wavelengths of hundreds of micrometers with high randomness, irreproducibility, and resistance to external stimuli. Importantly, to demonstrate the potential application of the wrinkle, we suggest and fabricate a human-finger-like fully soft identifiable artificial finger pad electronics and integrate it with a soft bimodal sensing system. The artificial finger pad mimics human finger pad features such as identification, object recognition, and effective grasping. Further integration of this pad into soft robots, cephalopods, and prosthetic skin offers insightful potential for the proposed wrinkling method in various fields.

The study of wrinkles—pervasive patterns observed in nature—contributes to substantial technical advancements in areas such as optical property modulation[1–4], wettability control[5,6], dynamic adhesion[7,8], and stretchable electronics[9]. In particular, irreproducible wrinkling, which generates unique arbitrary patterns each time, has attracted significant attention owing to its applications in entity identification and anti-counterfeiting (e.g., physical unclonable functions)[10–14]. Presently, the effective detection and authentication of patterns with a range of nano- to submicron-scale wrinkle wavelengths require high-cost, high-resolution, and complex systems[11,12]. Furthermore, the absence of a mechanically deformable feature in these patterns (capable of enduring external stimuli) restricts their applicability because their practical applications often subject these patterns to various external stimuli such as mechanical deformation and physical contact[15,16]. The significant challenges associated with creating discernible patterns with large-wavelength wrinkles (on the order of hundreds of micrometers) and ensuring their mechanical deformability remain unaddressed. The present situation is attributed to the inherent difficulty in achieving large-wavelength wrinkling with irreproducible patterns on elastomer surfaces and a lack of substantial applications that could spur intensive research in this field. Therefore, there is a need to develop an approach to creating sufficiently discernible random wrinkles with mechanically deformable features via a facile process, as well as identifying impactful applications for such wrinkle patterns.

Here, we propose an innovative strategy, termed "spin evaporation", to form discernible and irreproducible wrinkles on styrene-

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Facile strategy for uniform gold coating on silver nanowires embedded PDMS for soft electronics

Haechan Park[1], Sehyun Kim[1], Juyeong Lee[1], Kwangmin Kim[1], Hanah Na[2], Yeeun Kim[1], Daeun Kim[1], Donghyung Shin[1], BongSoo Kim[1,3,4] & Kyoseung Sim[1,5]

Silver nanowires-embedded polydimethylsiloxane (AgNWs/PDMS) electrodes are promising components for various soft electronics, but face energy mismatch with organic semiconductors. Attempts at galvanic replacement, involving spontaneous gold (Au) formation on the electrodes, often result in non-uniform and particulate Au coatings, compromising device performance and stability. In this study, we introduce a novel approach for achieving a uniform and complete Au coating on AgNWs/PDMS electrodes by adding NaCl to the Au complex solution. This addition slows down the galvanic replacement process and prevents precipitation, enabling a uniform and complete Au coating on the AgNWs surface. Such coating significantly reduces contact resistance (R_C), thereby enhancing the electrical characteristics of *p*-type organic transistors. Furthermore, the development of high-performance, fully soft organic transistors was achieved incorporating an organic semiconductor-elastomer blend. Additionally, reliable, mechanically stable soft glucose sensor was developed, taking advantage of the complete Au coating, which protects against oxidation during the glucose sensing process.

Recent interest in wearable electronics has intensified due to its promising potential for practical usability[1–4]. Many advancements, including structural engineering and innovative material design, have paved the way for soft electronics, such as skin-mountable and bio-implantable devices[1–7]. Particularly, studies in intrinsically stretchable electronic materials and rubbery composites have played a crucial role in developing fully soft organic electronic devices that enable intimate mounting on skin or implanting into the human body[3,6,7]. While such material development has been a primary focus, the interface between components is indeed critical for the significant advancement of high-performance fully soft organic electronics[8–10]. The contact resistance (R_C), mainly induced by the difference between Fermi levels (E_F) of metal electrodes and energy levels of semiconductors, obstructs charge carrier transport at the interface, hampering field-effect mobility in organic transistors[9,10]. However, interfacial engineering for minimizing R_C in fully soft organic transistors has been overlooked, although efforts in reducing it for rigid and flat transistors have been studied[8,11,12], which is not compatible with devices that are made out of only soft components. Thus, there is an urgent need in the development of the appropriate approach to form better interface for fully soft organic electronics.

The recently developed fully soft organic transistors, which employ silver nanowires-embedded PDMS (AgNWs/PDMS) as a soft electrode, are promising due to their exceptional electrical and mechanical properties. However, they face an inherent challenge regarding the energy barrier between silver ($E_{F,Ag}$ is from −4.26 eV), and typical *p*-type organic semiconductors (E_{HOMO} is from −4.90 to −5.50 eV)[13,14]. A common solution, the galvanic replacement of the AgNWs surface with gold ($E_{F,Au}$ is −5.09 eV), ensures ohmic contact between soft electrodes and the organic semiconductor[15–17]. Nonetheless, this method often leads to non-uniform gold particulation on AgNWs due to the vigorous redox reaction[18,19]. Particularly, incomplete gold coverage and a rough surface can result in a large R_C in soft transistors[19]. Moreover, inconsistent gold coverage on AgNWs within the AgNWs/PDMS electrodes limits their application in soft biosensors due to the chemical instability of silver[20]. Therefore, a more

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Chemically and physically enhanced adhesion for robust interfaces in all-soft vertical organic photodetectors†

Haechan Park, ‡[a] Daeun Kim,‡[a] Sehyun Kim,[a] Myeonghyeon Na, [a] Yeeun Kim[a] and Kyoseung Sim ★[ab]

We report all-soft vertical organic photodetectors composed of only soft components. Chemically and physically enhanced interfacial adhesion between layers enables robust operation under mechanical deformation. Their excellent light-sensing capability and deformable features, combined with powerless operation, promise significant advancements in optoelectronic applications.

The development of organic photodetectors (OPDs) has substantially impacted various technological fields, representing their high potential for applications in healthcare monitoring, optical communications, and imaging technologies.[1–3] Specifically, their distinctive characteristics, including lightweight, cost-effectiveness, tunable light absorption range, and mechanical softness, set them apart from inorganic photodetectors and make them indispensable for wearable applications across diverse purposes.[2,3] Such unique features have led to a continuously growing interest in developing mechanically deformable OPDs.[4,5] However, most research primarily focuses on bendable OPDs, which face mechanical incompatibility with soft and stretchable human skin, thus limiting their applicability.[6] Hence, developing stretchable OPDs is urgent to overcome these challenges and ensure reliable performance in wearable applications.[1,4,6]

Employing only mechanically soft materials for OPDs (namely all-soft OPDs) is ideal for realizing stretchable devices, as it offers durable mechanical properties, a simple fabrication process, and easy bio-integration compared to conventional structural engineering methods for strain elimination (*e.g.*, wrinkling, serpentines, origami, and kirigami).[1,7] While a few studies have highlighted the development of stretchable OPDs made entirely of soft materials, their planar configuration inevitably faces low performance due to a limited light-harvesting area and long charge transport distance, presenting a significant challenge.[8,9]

A promising strategy for enhancing the performance of all-soft OPDs involves adopting a vertical configuration. Generally, vertical OPDs (v-OPDs) provide a shorter charge transport distance determined by the thickness of the light-sensing layer, enabling more efficient charge transport and faster response times compared to planar OPDs.[5] Several studies have explored all-soft v-OPDs using simple approaches such as depositing eutectic gallium–indium (EGaIn) as a top electrode on the light-sensing layer.[10–13] However, the opaque nature of the metal electrode prevents maximized light harvesting. Alternatively, a soft transparent electrode would be the most promising candidate.[14,15] Simple stacking, laminating, or assembly of the transparent conducting layer possesses substantial potential for excellent light sensing characteristics and cost-effective manufacturing. However, it is important to note that it is impossible to match the mechanical properties of each layer perfectly in the devices. This mismatch leads to physical delamination and interfacial stress concentration under mechanical deformation, which are critical causes of electrical failure and fatigue fracture.[16,17] Therefore, interfacial adhesion between the layers of devices must be carefully considered and significantly enhanced to ensure high performance and robust all-soft v-OPDs, which remains a critical challenge in this field.

Here, we report all-soft v-OPDs composed of only soft materials, including the light-sensing layers, electrodes, and substrates. The devices were fabricated by assembling two separate substrates: (1) the anode substrate and (2) the cathode substrate with a light-sensing layer. Enhanced interfacial adhesion between two substrates was achieved by introducing covalent-bond-forming molecules into the substrate and molecules that increase van der Waals interactions into the electrode. Employing (3-glycidyloxypropyl)trimethoxysilane (GPTMS) and (3-aminopropyl)triethoxysilane (APTES) on top of each polydimethylsiloxane (PDMS) substrate enables covalent bonding between the two separate substrates, ensuring irreversible strong adhesion.

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‡ Theses authors contributed equally to this work.

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Organic flexible electronics with closed-loop recycling for sustainable wearable technology

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Haechan Park[1], Sehyun Kim[1], Juyeong Lee[1], Inwoo Lee[1], Sujitkumar Bontapalle[1], Younghoon Na[1] & Kyoseung Sim[1,2]

Flexible organic electronics can be used to create wearable devices but the synthesis of organic electronic materials typically involves hazardous solvents, creates toxic by-products and has various other environmental and economic costs. Being able to recycle organic electronic materials and devices in an eco-friendly and economical manner is thus key for their application in sustainable wearable electronics. Here we report organic flexible electronic devices with closed-loop recycling of each component. We develop approaches to recapture and reuse organic conductors, semiconductors and gate dielectrics, and evaluate the reliability of the recycled materials. Our fabrication and recycling processes also use only eco-friendly solvents (water, anisole and acetone). We illustrate the capabilities of the approach with various recyclable organic flexible electronic devices, including electrophysiological sensing electrodes, keypads, heaters/temperature sensors, electrochemical transistors and inverters. We also develop a sustainable device cycle by reconstructing various organic flexible electronics, which are fabricated using recycled materials from different functional devices without further replenishment.

The production and disposal of electronic devices can generate hazardous electronic waste (e-waste) and consumes energy and resources. To overcome these issues, technologies are being explored that can recycle e-waste[1,2]. However, these have typically focused on the e-waste produced from conventional electronic devices and are unsuitable for wearable devices based on flexible materials. Efforts to recycle flexible electronics have been developed, including reusing substrates[3–5], recapturing conductive materials[4–6] (such as silver nanowires[7,8] and liquid metals[3,9]) and reclaiming carbon-based components[10,11]. However, these methods cannot be applied to recycle advanced functional materials such as organic electronic materials.

Organic electronic materials have been used to implement various electronic devices[12–15]. The synthesis, use and disposal of these materials can though adversely affect the environment and human health. The synthesis of organic materials requires condensation polymerization, which typically requires hazardous solvents such as *N*-methylpyrrolidone (NMP), *N*,*N*′-dimethylformamide (DMF), toluene and chlorinated chemicals. Approximately 90% of these solvents are disposed of as waste and cause considerable environmental pollution[16]. Additionally, the synthesis process often generates toxic by-products[17,18] (such as organotin compounds from Stille coupling) and involves costly production steps (such as time-consuming processes involving long synthetic routes, high-cost reactions using precious metal-based catalysts and energy/materials-inefficient processes requiring high temperatures and extensive purification)[19].

Discarding organic electronic waste can generate environmental and human health issues because the general molecular building blocks for organic electronic materials (for example, thiophene, furan, azole and other aromatic cyclic hydrocarbons) often have severe risks of genotoxicity and cytotoxicity[20–22]. Various sustainable approaches have

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Journal of Materials Chemistry C

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A skin-friendly soft strain sensor with direct skin adhesion enabled by using a non-toxic surfactant†

Haechan Park,‡[a] Myeonghyeon Na,‡[a] Donghyung Shin,‡[a] Daeun Kim,[a] Euna Kim,[b] Sehyun Kim,[a] Donghyun Lee[b] and Kyoseung Sim*[ac]

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Wearable electronics, particularly soft strain sensors with direct skin adhesion, play a crucial role in applications such as smart healthcare systems and human–machine interfaces. However, the existing approaches for developing dry-adhesive soft electronic materials often involve potential biotoxicity and vulnerability to humid environments. In this study, we present an eco-friendly and biocompatible surfactant-based composite for soft conductive composite, soft dry-adhesive film, and skin-adherable soft strain sensors. Utilizing polyoxyethylene sorbitan monooleate, also known as Tween 80, as a non-toxic surfactant, polydimethylsiloxane (PDMS) as an elastomeric matrix, and poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS) as a conductive pathway, the composite exhibits excellent stretchability and conductivity. The soft dry-adhesive film based on Tween 80-added PDMS features exceptional softness and adhesiveness. We demonstrate a soft strain sensor based on these composites that can be directly adhered to the skin and effectively detect various human motions involving large deformations without delamination. This approach offers a promising avenue for future wearable electronics that are safe for both humans and the environment.

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† Electronic supplementary information (ESI) available. See DOI: https://doi.org/10.1039/d3tc01150j

‡ These authors contributed equally to this work.

Kyoseung Sim

Kyoseung Sim has been an assistant professor in the Department of Chemistry at the Ulsan National Institute of Science and Technology (UNIST) since Spring 2020. He earned his PhD in Materials Science and Engineering from the University of Houston in 2018, under the supervision of Cunjiang Yu. Dr Sim's current research focuses on soft electronics, specifically organic semiconductors and their system-level applications.

1. Introductions

Soft electronics, which enable direct adhesion to the skin in a dry manner, provide significant benefits for advanced wearable electronic applications, such as smart healthcare systems and human–machine interfaces (HMIs).[1–3] Specifically, a soft strain sensor with dry-adhesiveness provides a clean, environmentally friendly skin-mounting approach that is reusable, easy to reposition, and enables conformal contact with the skin.[4] These advantages make it an excellent choice for human motion monitoring, as it allows for comfortable and robust application on largely deformable body joints (*e.g.*, fingers, knees, and elbows) due to its mechanically soft nature.[5] Over the past decades, extensive efforts have been made to develop dry-adhesive properties for wearable electronics through various approaches, such as micro/nanostructure design, van der Waals force enhancement, and elasticity modulation.[6–10] However, the limited mechanical softness and potential biotoxicity restrict their effective application to wearable platforms for the human body.

Recently, significant advancements have been achieved for dry-adhesive soft electronic materials by developing elastomeric composites based on organic materials exhibiting excellent softness and electrical characteristics.[6,11,12] Particularly, the poly(3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS), a conductive polymer, was widely used for preparing the composite with water-soluble polymers, such as polyvinyl alcohol (PVA) and waterborne-polyurethane (WPU), due to the high miscibility

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Soft Science

Research Article

Open Access

Soft Schottky diodes for skin-interfaced electronics enabled by entirely soft components

Donghyung Shin[1,#], Sehyun Kim[1,#], Haechan Park[1], Yeeun Kim[1], Myeonghyeon Na[1], Daeun Kim[1], Kyoseung Sim[1,2,*]

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Abstract

Soft electronics have achieved significant development, attracting substantial interest due to their promising potential as a dominant form of future electronics. In this rapidly evolving field, the fully soft Schottky diode plays a critical role as a fundamental building block for electronic circuitry systems. These systems, constructed entirely from soft materials, can tolerate various mechanical deformations when interfaced with human skin, making them ideal for use in health monitoring systems and interactive human-machine interfaces. In this study, we introduce a Schottky diode fabricated entirely from soft materials using a facile solution process, further enabling all-printing fabrication systems. Utilizing the mechanical softness of poly(3,4-ethylenedioxythiophene) polystyrene sulfonate-based soft electrode, poly(3-hexylthiophene) nanofibril composite soft semiconductor, and liquid metal, we successfully fabricated a fully soft Schottky diode. This diode exhibits exceptional electrical characteristics even under various mechanical deformations, showcasing the high durability of the device. We have further developed fully soft rectifiers and logic gates, highlighting the versatility of our study. By incorporating these devices with a piezoelectric nanogenerator in a skin-interfaced energy harvesting system, they exhibit sufficient capability for rectification, ensuring a stable power supply as part of a power supply management system. This approach offers substantial potential for future skin-interfaced electronics, paving the way for advanced wearable technology.

Keywords: Soft Schottky diode, skin-interfaced electronics, fully soft electronics, soft full-wave bridge rectifier

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Fully soft organic electrochemical transistor enabling direct skin-mountable electrophysiological signal amplification†

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Here, we propose fully soft OECTs with all soft components, including a PEDOT:PSS-based soft channel, which show substantial mechanical/electrical properties. In addition, the further demonstrated skin-mountable amplifier implies the strong potential of this work to be an innovative development in wearable electronics.

Soft wearable electronics that enable direct skin mounting with conformal contact allow the realization of advanced applications in a wide range of fields, such as smart healthcare systems, non-losable devices, internet of things, and artificial sensory skin.[1–3] Significantly, the fully soft electronic devices made by only soft components are attracting considerable attention due to several reasons. Few of them are simple fabrication process, dynamic shape change, and mechanical durability against physical impacts, compared to the approaches for strain elimination by structural engineering that utilize wrinkle, serpentine, rigid-island with stretchable interconnects, and kirigami.[3] For this reason, intensive efforts have been made to develop various types of fully soft electronic devices, such as field-effect transistors, strain sensors, pressure sensors, and optoelectronics.[3]

However, one of the critical electronic devices, organic electrochemical transistors (OECTs) with the fully soft format, have not been considerably studied despite their substantial advantageous vital features. These include sub-voltage operable characteristics, high transconductance (g_m), and their promising potential for bountiful applications (*e.g.*, bio-sensing, neuromorphic devices, electrophysiological signal acquisition, and cell activity mapping).[4] Although numerous bendable OECTs were reported,[5] the primary reason for the lack of the successful development of fully soft OECTs that can stretch and deform is the failure of the discovery of suitable soft electrical components, namely active channel materials, source/drain electrodes, electrolytes, and the gate electrodes. Particularly, developing soft active channel materials for fully soft OECTs capable of maintaining high g_m under mechanical strain remains a challenge. Recently, some stretchable OECTs have been reported.[6–9] However, such devices were achieved through strain elimination by structural engineering, which involves complicated fabrication processes, sophisticated design, difficulty in packaging, and high-cost manufacturing. Furthermore, although a few soft OECTs based on stretchable electrodes are demonstrated, those devices still exploit non-stretchable external gate electrodes, and show relatively low g_m.[10,11] Therefore, high performance fully soft OECTs prepared by only soft components, particularly soft active channel as well as soft electrodes, need to be developed.

Here, we introduce fully soft OECTs based on a soft active channel, elastomeric source/drain electrodes, gel electrolyte, and soft gate electrode. These devices show high electrical performance and maintain normal operation under the mechanical strain of 30%, which is a typical stretchability of human skin.[12] The soft active channel was developed using poly(3,4-ethyelendioxythiophene):poly (styrene sulfonate) (PEDOT:PSS) with specially added polyethylene glycol (PEG) and divinyl sulfone (DVS). The PEG addition into the PEDOT:PSS involved current enhancement due to the strong phase separation between PEDOT and PSS domains by hydrogen bonds. In addition, PEG acts as a plasticizer that softens the active channel materials, leading to a low modulus of the film as well as self-healing characteristics.[13,14] Furthermore, DVS allows the devices to be more stable under humid environments due to crosslinking between PEG chains by DVS as a bridge. We used stretchable electrodes prepared by percolated silver nanowires (AgNWs) in an elastomeric matrix (styrene–ethylene–butylene–styrene, SEBS) with gold nanoparticles (AuNPs) on top of exposed AgNWs by galvanic replacement to minimize the barrier of charge transportation.[15] The iongel was adopted as a quasi-solid electrolyte due to its leakage/evaporation-free and soft nature. The developed fully soft OECTs present direct skin-mountable features due to their mechanical softness. To show the systematic development of this work, we present three sequentially evolving soft active channel-based OECTs,

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