



IEC/TC OR SC: TC 119	SECRETARIAT: Korea, Rep. of	DATE: 2019-11-22
--------------------------------	---------------------------------------	----------------------------

Please ensure this form is annexed to the Report to the Standardization Management Board if it has been prepared during a meeting, or sent to the Central Office promptly after its contents have been agreed by the committee.

A. STATE TITLE AND SCOPE OF TC

The title of the technical committee 119 is Printed Electronics.

The scope of TC119 is the standardization of terminology, materials, processes, equipments, products and health/safety/environment in the field of printed electronics.

Due to the trend towards a globalised, technical and connected society there is a rising demand for a new breed of technologies enabling flexible, stretchable and structural electronic products. Conventional technologies such as silicon-based microelectronics have reached their limits due to their high fabrication costs and sustainability issues. Through the use of printing technologies (such as screen, gravure, reverse gravure, flexo, offset, ink jet) and innovative materials, printed electronics has emerged as a sustainable route to produce electronic/display/energy products at a low cost and with new possibilities of such creative technologies as flexible stretchable and structural electronic products. Printed Electronics can now be applied to the manufacture of items such as photovoltaic devices, signage, RFID, batteries, lighting devices, etc., where cost, flexibility and sustainability are critical issues. In addition, printing technologies in combination with other electronics technologies form hybrid systems which showed promising market potential in areas such as wearable smart devices. For successful industrialization of this technology, reliability and repeatability in equipment and processes should be provided under global standardization.

Standardization needs in printed electronics had been discussed world-widely in academic societies and industrial societies since 2008. However, a practical movement was initiated by Korean proposal to form a new TC under the IEC in June 2011. The IEC SMB decided to establish a new technical committee for the field of printed electronics, TC119, and appointed the Republic of Korea as the secretariat country in October 2011. Currently the TC has 11 P-members and 9 O-members.

B. MANAGEMENT STRUCTURE OF THE TC

Since printed electronics is still evolving and expanding vigorously, the structure of the TC is preferred to be flexible so as to effectively follow the rapid change but not constrain it. Careful consideration of the results of several discussions in early Plenary Meetings made a decision that the WG structure should cover the following essential areas: terminology, materials, equipment, printability, printed products, and quality assurance.

In the 9th Plenary Meeting duration held in Shanghai, China in 2019, this SBP document was revised with modifications or confirmed with changes to the scopes of AG, WGs and AHG as follow.

- AG1 (Advisory Group)

The scope was changed to remove the secondary objectives. It now reads as follows.

- The Scope of TC119
- Liaison strategy and conflict management
- Maintenance of the Strategic Business Plan

- WG1 (Terminology and Roadmap)

- To produce terminology definitions and standardisation roadmap for the field of printed electronics.

- WG2 (Materials)

- To develop measuring methods and evaluation methods for materials such as substrates, inks,

composite substrates and related materials for printed electronics.

- To analyse the effectiveness of the existing methods specific to the materials of printed electronics
- To define specific terms and to determine assessments, requirements, specifications and reliability of materials for printed electronics.
- NOTE: Composite substrates include laminated substrates having multi-layer structure.
- WG3 (Equipment)
 - Standardization for printing, coating, other related equipment, tools, sub-units and parts, used for the manufacture and evaluation of printed electronics.
- WG4 (Printability)
 - The measurements or requirements of both the qualities of printed patterns and the reproducibility of printing designs as the result of interaction of printing media, inks, substrates, and environmental conditions. Concerning process conditions for some specific products, they would be discussed at sectional specification or blank detail specification. Printing media includes the parts involved in printing process such as plate, cliché, blanket, nozzle, etc, excluding inks and substrate.
- WG5 (Quality assessment)
 - The work process in this group will generate test methods and procedures for the measurement of specified product parameters, for lifetime assessment and for reliability testing and stressing of printed and/or flexible electronics components and products

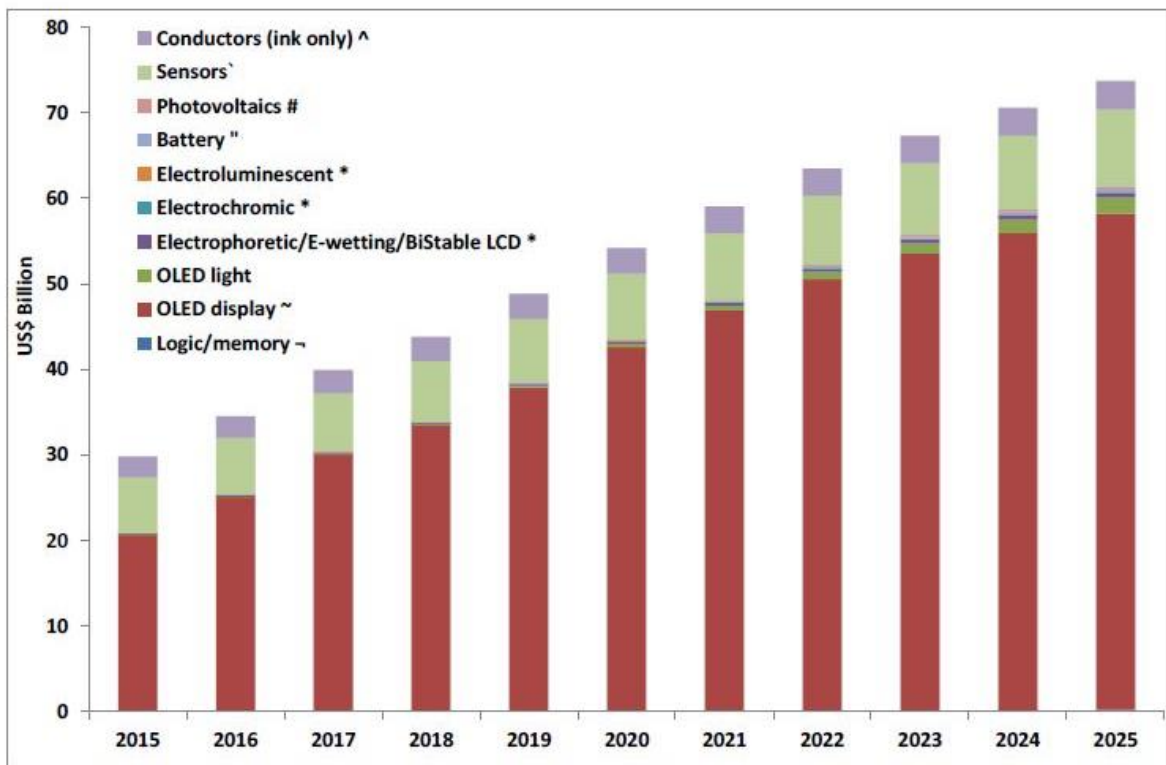
C. BUSINESS ENVIRONMENT

The 21st century global society demands that any new technology gives due consideration to sustainability as well as economic factors. This creates an incentive for alternatives to conventional silicon technology based on photolithography and creates an opportunity for printed electronics to manufacture devices with high volume capability, high efficiency, low cost and high performance. Owing to this innovative method, and the adoption of societal concepts such as the Internet of Things the commercialization of ubiquitous electronics such as photovoltaics, RFID, signage, etc. is being accelerated. Furthermore, devices with new concepts such as flexible, stretchable and structural electronics are now being introduced into the global market. Besides the efficiency from an engineering viewpoint, there is another advantage in this technology in terms of the sustainability aspect.

IEC TC 119 notes the commitment made by the IEC to the UN Sustainable Development Goals, and the formation of SMB ahG 84. The work of IEC TC 119 has already been mentioned in the IEC publication "Contributing to Sustainable Development Goals" under SDG8. There is an aim to build on this and add contribution to SDG 12 Responsible consumption and production.

Industrialization of this field is now acknowledged by several countries including Korea, Japan, Germany, USA, UK etc. In the case of Korea, the organization for printed electronics named KoPEA was founded in 2010 in order to promote its industrialization.

Current market size for printed and potentially printed electronics including organic, inorganic, and composites from IDTechEx report in 2015 is \$29.80 billion in 2015. It is expected to be grown up to \$54.19 billion in 2020. Market segmentation is presented in the Figure 1.



Source IDTechEx

Figure 1. Market forecast by component type for 2015~2025 in US \$ billions, for printed and potentially printed electronics including organic, inorganic, and composites. [Source: IDTechEx (2015), www.idtechex.com]

There are more than 3000 companies related to printed electronics. In Figures 2 (a) and (b), the distribution of these companies is presented in terms of region and technical field, respectively.

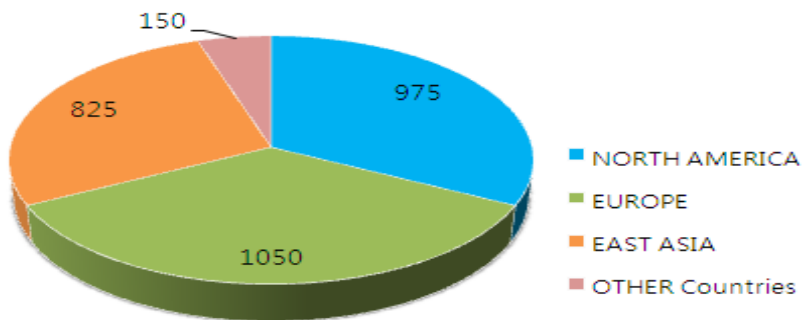


Figure 2 (a) Distribution of the related companies (Region)

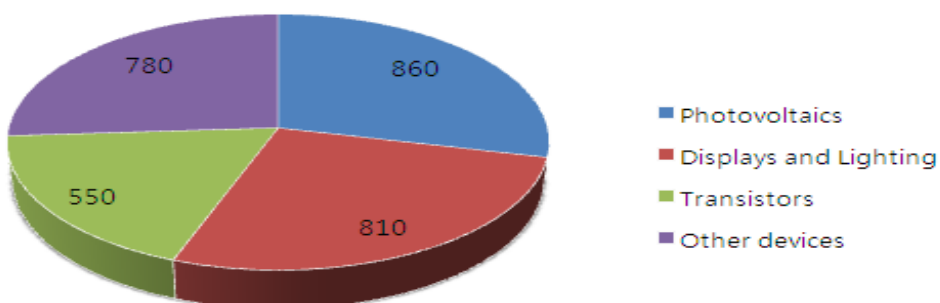


Figure 2 (b) Distribution of the related companies (Product)

D. MARKET DEMAND

As described in the previous section more than 3000 companies are primary customers for the international standards which will be produced by TC119. Since this technology is ready to industrialize and facilitate ubiquitous electronics, it is agreed that only standardization can reduce the initial cost for this industrialization and guide effective direction so as to stabilize and expand this market. For example, the need for standardization was expressed by academic and industrial delegates at International Conferences such as ICFPE in 2009.

The proposal to establish a standardization body for the printed electronics was presented at Printed Electronics Europe 2011 and the agreement on this proposal was made among participants from many countries. The proposal indicated the IEC as the most suitable place for the printed electronics since the technology intends to develop mainly electronic and electric devices for the global society. Also, there was no objection from any country on the IEC scheme.

IEC TC110 (Title: Electronic Display Devices) started to cover only a flexible display panel, only a small part of standardization issues which are related to the areas of the printed electronics. IEC TC 119 will cover entire fields in ubiquitous electronics where new concepts of technology including materials, equipment, parts, processes, barrier layers and encapsulation etc. are highly demanded.

E. TRENDS IN TECHNOLOGY AND IN THE MARKET

As a technology trend, there are many printing techniques to be considered in fabricating electronic devices such as flexo, offset, inkjet, gravure, screen printing, etc where roll to roll, roll to sheet or sheet to sheet web transfer methods are utilized. Each printing technique for electronics fabrication has been developed over the previous decades. As a result, they are ready to be applied to the practical production of ubiquitous electronics. For example, there were many core technologies developed for roll-to-roll (R2R) printing methods such as substrate handling, ink transfer, register control, fast curing at lower temperatures, and noncontact transportation. These core technologies had been developed over the last ten years. Integration of the core technologies are completed so as to guarantee the high performance of devices fabricated by R2R printing. The target devices include low cost disposable and flexible solar cells, flexible batteries, large area display, RFID, NFC and sensors for ubiquitous electronics and wearable electronics. Reliability and reproducibility should be a major consideration in order to successfully bring these products to market. However, reliability and reproducibility are not only an equipment issue, but more complex issues exist between materials, process and equipment. That is why unlike other TCs in IEC or ISO, the standardization in printed electronics, TC 119, requires combinatorial standardization in materials, processes, equipment and devices. This standardization is urgently necessary to lead printed electronics to successful commercialization

For market's point of view there are lots of advantages when this technology is applied to the electronic and electrical industry. It enables us to fabricate massive scale products with high throughput and extremely low cost for flexible, stretchable and structural electronics. Accordingly, the current silicon technology based on photolithography should be replaced by printing technology in the field of ubiquitous electronics. The expected growth of the market is listed in the Figure 1. The technology focus has now shifted to applying these techniques to fabricate real devices from developing core technologies. TC 119 will focus on supporting the strategy and road map reflecting the ubiquitous electronic market trends. Hence the international standards published by the TC 119 will open the related market and industry.

F. SYSTEM APPROACH ASPECTS (REFERENCE - AC/33/2013)

Printed electronics has emerged from conventional electronics by reshaping and empowering them with printing technologies. The success of this field hinges on how effectively the leaders of the field team up with counterparts of pre-existing electronics industries. Thus, it is critical to carry out standardization activities in close collaboration with other pre-existing TCs by using the following strategy.

Identifying all potential areas that require collaboration and prepare a systematic approach plan (as shown below) that shows how each area of TC 119 needs cooperation with other TCs or academic/industrial organization.

- Building a support network by establishing liaisons with other TCs or conjunctions with other academic or industrial organizations.
- Established liaisons with following TCs: TC47, TC 47/SC 47F, TC91, TC110, TC113, TC124 and ISO TC20, ISO/TC 61/SC 11, ISO TC130
- Established liaison with following organizations via C category: IPC, OE-A
- Considering liaison with following TCs: IEC SC34A

G. CONFORMITY ASSESSMENT

TC119 does not currently have any publications used for IEC conformity assessment system.

H. 3-5 YEAR PROJECTED STRATEGIC OBJECTIVES, ACTIONS, TARGET DATES

STRATEGIC OBJECTIVES 3-5 YEARS	ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES	TARGET DATE(S) TO COMPLETE THE ACTIONS
(Working Group 1) Produce terminology and standardization roadmaps for printed electronics	A work item is being published in November 2019 – IEC 62899-101	2019
(Working Group 2) Produce material standards to boost the PE industry.	Six work items of the functional inks as conductive inks are already in progress. – IEC 62899-202-6~10. Maintenance program for IEC 62899-202, -203 and IEC/TR 62899-250 has started or will start soon.	2021-2023 2020-2021
(Working Group 3) Establishment of standards for printing equipment, used for the manufacture and evaluation of printed electronics	Two work items for roll mast and inkjet head are in progress - IEC 62899-301-3 and IEC 62899-302-3. One work item for inkjet is under preparation It will be allocated to IEC 62899-302-4. Two technical reports about inkjet overview and size of sheet to sheet equipment are under preparation	2018-2021 2020 - 2022 2020 - 2021
(Working Group 4) Establishment of measurement method and reproducibility requirements of qualities in printed patterns	A work item of measurement of edge waviness is already in progress – IEC 62899-402-2. A work item of measurement of voids is already in progress – IEC 62899-402-3. Preliminary study for work items for measurement of vertical variance of patterns are already in progress as TR – IEC 62899-402-x.	2020 2021 2022
(Working Group 5) Reliability for mechanical/ environmental testing for printed and/or devices	A work item for Flexible primary and secondary batteries is in progress – IEC 62899-501-1 A work item for Flexible OLED elements has been completed – IEC 62899-502-1 A work item for Combined reliability for flexible OLEDs elements – IEC 62899-502-2 Work item in progress: Printed TFT channel properties – IEC 62899-503-1 Work item in progress: Printed TFT matrix – IEC 62899-503-2	IS 2019 IS 2017 (Review 2019) IS 2019 FDIS 2020 IS 2020 CD 2020 FDIS 2022 IS 2022

Work item in progress: printed thin film transistor by transfer length method IEC 62899-503-3	CDV 2020 FDIS 2021 IS 2022
Work item in progress: Printed flexible gas sensors – Future IEC 62899 505-1	FDIS 2020 IS 2020
Work item in progress: Printed film heater, IEC 62899-506-1	CD 2020 FDIS 2021 IS 2021
Work item in progress: TFT contact resistance / NFC temperature sensor system	NP 2020 WD 2020 CDV 2021 FDIS 2022 IS 2022
Work item in progress: Combined mechanical and thermal testing framework	CD 2019, TR 2020
Planned work item: Printed actuators / Printed smart tags /Sensor systems /printed electrode connection to wire	PWI 2020

Note: The progress on the actions should be reported in the RSMB.