

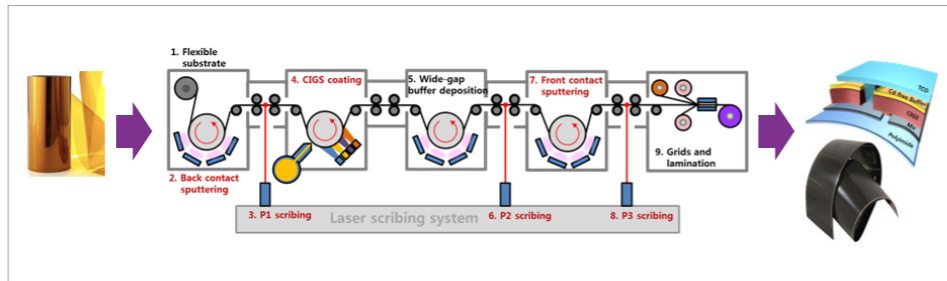
16

연구책임자
신재생에너지연구소
태양광연구실
곽지혜

고성능 경량 유연 화합물 무기 박막태양전지·모듈 제조 기술

기존의 태양광 시장은 물론 분산발전/이동전원에 적용이 매우 용이한 차세대 고효율 초경량 유연 무기 박막태양전지 제조기술로, Roll-to-Roll(R2R) 공정을 적용하여 경제·생산성을 보장함과 동시에 분산발전용 응용 제품(ex. 건물일체형 PV) 적용을 위해 태양광 모듈의 심미성도 고려하는 통합적 태양광 모듈 기술.


기술의 구성도/개념도



기술의 주요 내용 및 특징

- 유연 기판 적용 Cu(InGa)Se₂ (CIGS)계 광흡수층의 저온 성장 기술
- 외인성 알칼리 주입기술을 적용한 CIGS계 박막태양전지 고효율화
- R2R 공정을 도입한 생산성 높은 연속공정 실현
- 모노리식 연결 구조를 적용한 고전압 유연 무기 박막태양광 모듈 제조

기술의 적용처

응용분야	적용제품	
태양광 발전소, 가정용 태양광 모듈, 이동 전원	건물일체형 태양광모듈 / 자동차일체형 태양광모듈 / 이동 전원 / 일반 태양광 모듈 제품	 건물일체형 PV 적용

문의
한국에너지기술연구원
기술사업화실

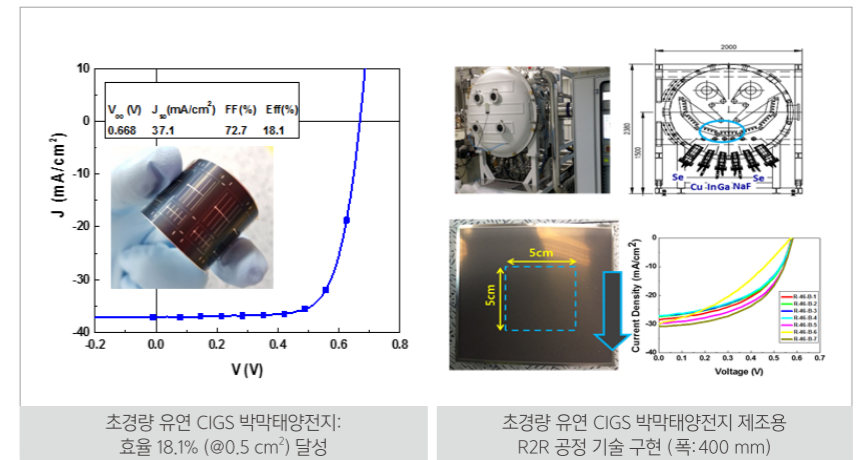
TEL
042-860-3384

E-mail
kier-tlo@kier.re.kr

기술의 비교우위성/ 기존 기술 대비 차별성

기존 기술	본 기술
<ul style="list-style-type: none"> • 기존 기판형 태양전지·모듈은 고효율 달성이 상대적으로 용이하나, 무거운 무게 및 정형화된 형태로 인하여 도심형 혹은 분산발전형 응용제품으로 확장에 한계가 명확함 	<ul style="list-style-type: none"> • 고성능(고효율)특성을 유지하면서, 다양한 형태로 제단 및 가공이 용이한 태양광 모듈 제조 가능 • 기존 태양광 모듈 대비 1/10 이하 무게로 다양한 고품위 분산발전형 태양광 응용제품 개발이 가능함

실험 및 실증 데이터



기술의 성숙도



[TRL 4: 실험실 규모의 소재/부품/시스템 핵심성능 평가]

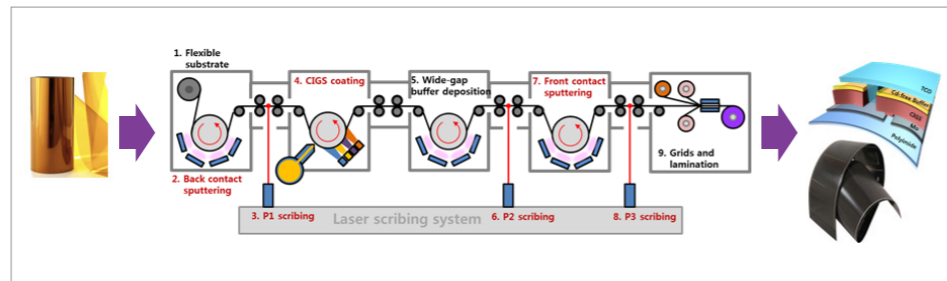
순번	발명의 명칭	출원번호	출원일자	등록번호	등록일자
1	ACIGS 박막의 저온 형성방법과 이를 이용한 태양전지의 제조방법	10-2015-0152424	2015.10.30	10-1734362-00-00	2017.05.02
2	태양 전지 및 이의 제조방법	10-2017-0053967	2017.04.26	10-1880640	2018.07.16
3	박막 태양전지용 연성기판의 응력 완화 방법	10-2017-0024089	2017.02.23	10-1924216-00-00	2018.07.06
4	유연기판용 고정 방법 및 이에 대한 장치	10-2017-0024088	2017.02.23	10-1924216-00-00	2018.11.26

Principal researcher
Photovoltaics
Laboratory of the New
and Renewable Energy
Institute
Gwak Ji-Hye

Manufacturing Technology of High-performance Lightweight Flexible Compound Thin-film Solar Cells and Modules

Manufacturing technology of high-efficiency lightweight flexible compound thin-film solar cells can be easily applied to not only conventional PV products but also next-generation PV applications such as building-integrated PV modules and portable power supplies. The primary goal of this research is to develop comprehensive thin-film PV technologies ensuring high productivity by applying the roll-to-roll (R2R) process and aesthetic aspect of PV modules by implementing colors and/or using cuttable-flexural substrates.


Structural Diagram/Conceptual Diagram



Description and Characteristics of Technology

- Development of low-temperature processing for CIGS-based absorber layers on polymer-based flexible substrates
- Development of high-efficiency CIGS-based thin-film solar cells with extrinsic alkali addition
- High-yield continuous-manufacturing system based on R2R process
- Manufacturing of high-voltage flexible inorganic thin-film PV modules with monolithic interconnection

Scope of Application

Application Fields	Products	
PV power generation in Residential/ Commercial/Industrial, and Utility portable power supplies	Building-integrated PV modules / Vehicle-integrated PV modules / Portable power supplies / PV module products for general purposes	 Building-integrated PV

Inquiries
Business Development
Team of the Korea
Institute of Energy
Research

Tel
042-860-3384

E-mail
kier-tlo@kier.re.kr

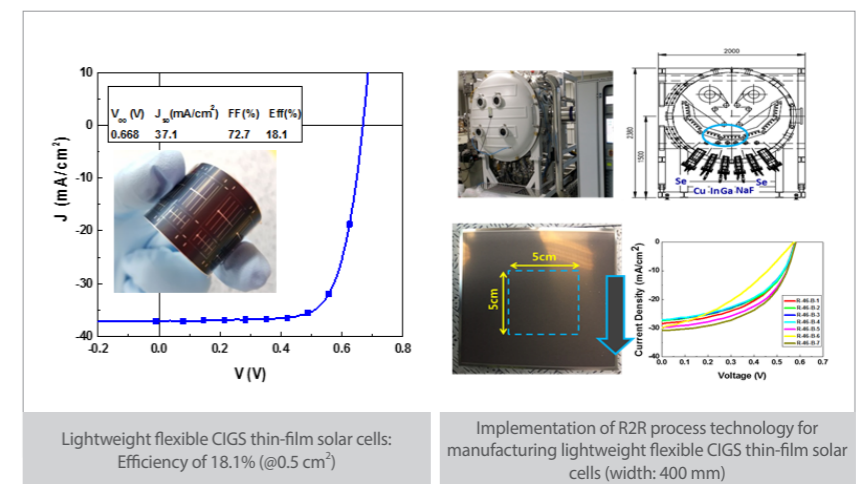
Comparative advantages of technology / Differentiation from existing technologies

Experimental and empirical data

Maturity level of technology

Current status of intellectual property rights

Conventional Technology	Present Technology
<ul style="list-style-type: none"> • With conventional rigid substrates, it is relatively easy to achieve high-efficiency cells and modules; however, the resulting products are typically heavy in weight and provide only narrow margin of aesthetic design, consequently limiting an area of application. Therefore, the conventional PV products should be redesigned so as to meet the requirements of urban or distributed power generation applications. 	<ul style="list-style-type: none"> • The technology now under development is capable of manufacturing PV modules that can be tailored and designed in various shapes while maintaining high performances. • This technology is capable of developing various kinds of flexible high-performance PV applications aiming at distributed power generation. The weight of the PV module developed by this technology is lighter than one-tenth of that of conventional PV module.



[TRL 4: Key performance evaluation of lab-scale materials/components/systems]

No.	Title of Invention	Application Number	Application Date	Registration Number	Registration Date
1	Forming method for ACIGS film at low temperature and manufacturing method for solar cell by using the forming method	10-2015-0152424	2015.10.30	10-1734362-00-00	2017.05.02
2	Solar cell and manufacturing method thereof	10-2017-0053967	2017.04.26	10-1880640	2018.07.16
3	Method for alleviating stress of flexible substrate for thin film solar cell	10-2017-0024089	2017.02.23	10-1924216-00-00	2018.07.06
4	Method and apparatus for fixing flexible substrate	10-2017-0024088	2017.02.23	10-1924216-00-00	2018.11.26