COMPANY UPDATE

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Flexell Space (Unlisted)

Space solar cell firm nearing commercialization

- Flexell Space is a domestic startup that is developing (and planning to produce) space solar cells. Among Korean companies, it appears to be closest to commercializing space solar cell technology.
- The company's technology is expected to overcome the current limitations of mainstream space solar cells in low earth orbit applications. Given its planned IPO in 2028, it is likely to attract growing interest from capital markets.

WHAT'S THE STORY?

Company overview: Flexell Space, which began in 2023 as an in-house venture of Hanwha Systems, was incorporated in Sep 2024 as a company specializing in space-grade solar cells. It plans to primarily focus on the production of thin-film heterojunction solar cells combining: 1) perovskite and copper indium gallium selenide (CIGS); or 2) perovskite-CIGS tandem cells.

Point (1) Product portfolio suitable for space data centers: Perovskite-CIGS tandem cells, while exhibiting lower technological maturity compared to III-V compounds, offer significantly higher specific power (power delivered per unit of mass), providing a distinct lightweight design advantage. Perovskite-CIGS tandem cells also demonstrate superior cost competitiveness vs III-V compounds, making them a more suitable solar cell technology for low Earth orbit (LEO) applications where cost sensitivity is a key consideration. Compared to silicon-based cells, perovskite-CIGS tandem cells deliver higher specific power and enable ultra-lightweight, flexible thin-film configurations—offering meaningful potential to reduce launch costs associated with space-based solar array deployment.

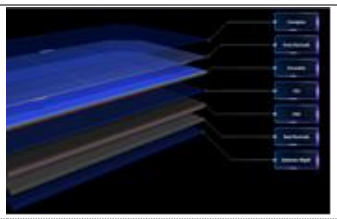
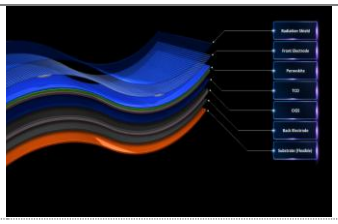
(Continued on the next page)

Point (2) Limited resource security risk: The current mainstream technology for space solar cells is III-V compound multi-junction cells, primarily composed of gallium arsenide (GaAs), indium gallium phosphide (InGaP), and indium gallium arsenide (InGaAs). Among these, key raw materials—including gallium (Ga), indium phosphide (InP), and germanium (Ge)—are dominated by Chinese production and are subject to Chinese export controls. In other words, III-V-based systems remain highly exposed to geopolitical supply risks tied to China. In contrast, Flexell Space's perovskite-based top cells utilize formamidinium, cesium, lead, and bromine, while its CIGS-based bottom cells employ copper, indium, gallium, and selenium. As a result, Flexell Space's technology portfolio inherently carries a more limited resource security risk profile compared to conventional III-V materials'.

Point (3) Commercialization imminent: Flexell Space is preparing to launch three distinct product lines: 1) Blueshell—Perovskite-CIGS tandem cells on rigid substrate (to be launches in 2027); 2) Bluetack—Perovskite-CIGS tandem cells on flexible substrate (2028); and 3) Bluesail—Perovskite-CIGS tandem cells with rollable architecture (2029). With commercialization slated to begin as early as next year, Flexell Space is on track to become the first Korean company to bring perovskite-CIGS tandem solar cells to the market. To date, the company has signed MOUs with leading global space system integrators, including Terran Orbital (a Lockheed Martin subsidiary; US), NanoAvionics (Norway), Airbus (Germany), D-Orbit (Italy), and DHV Technology (Spain). As these partners are all satellite manufacturers or satellite power system providers, Flexell Space is expected to begin commercial sales primarily targeting the LEO satellite constellation market.

View—to enable domestication of space solar power technology: As the global space solar power industry is still in its infancy, and further as space solar power—alongside satellites—will likely be designated a strategic national priority, governments are likely to step up policy support. According to media reports, Flexell Space is preparing for mass-production next year and an IPO by end-2028. Positioned as a leading domestic enabler of space solar power technology, it is likely to attract growing interest from the capital market.

Flexell Space: Key product portfolio

	Blueshell	Bluetack	Bluesail
			
Key materials	Perovskite/CIGS Tandem	Perovskite/CIGS Tandem	Perovskite/CIGS Tandem
Method	Plug & play	Stick & peel	Deployable module (Bluetack-based)
Substrate	Solid metal (rigid)	Polyimide (flexible)	Polyimide (flexible) with support fixture
Target customers	Manufacturers with finalized satellite designs; Those sensitive to low vibration; GaAs-based solar cell manufacturers	Manufacturers with finalized or planned satellite designs; GaAs-based solar cell manufacturers; Space exploration, base shelters, and space power plant manufacturers	Manufacturers designing satellites; Those seeking multi-functional payloads; Space exploration, base shelters, and space power plant manufacturers
Advantages	Low cost, convenience (replaces existing cells), fast delivery	Low cost, convenience (replaces existing cells), fast delivery, lightweight, curved/small surface utilization, durability	Low cost, custom manufacturing, fast delivery, lightweight, high power output
Commercialization	2H27	2H28	2H29

Source: Company data

Space solar cells: Comparison by applicable materials

	Silicon	Group III-V compounds	Thin film	Perovskite
Key materials	c-Si	GaAs, InGaP, InGaAs	CIGS, CdTe	Perovskite
Efficiency*	20-28%	28-48%	14-30%	23-36%
Manufacturing cost	Low	Very expensive	Medium	Potentially low
EOL performance	Low	Very high	Medium	Uncertain
Radiation resistance	Medium	Very high	Medium	High
Specific power	Low	Medium	High	Very high
Technical maturity	Very high	Very high	Medium	Low
Primary application	Terrestrial, LEO	MEO, GEO	LEO (Mainly CIGS)	LEO

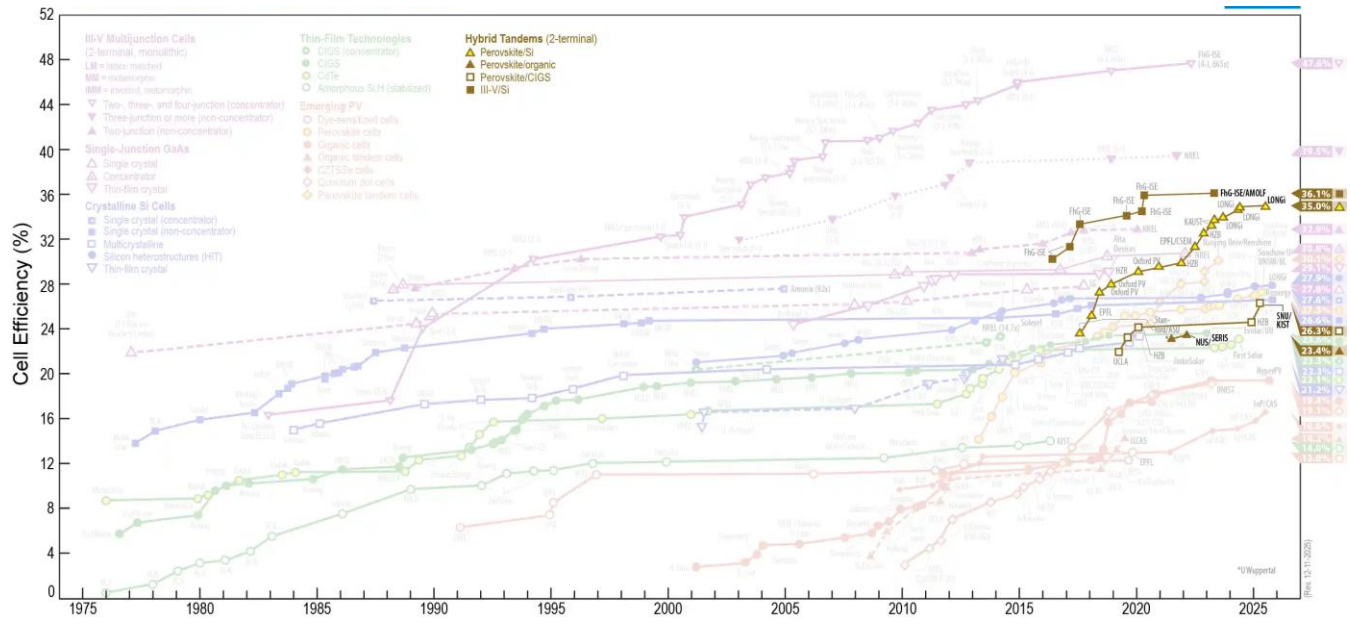
Note: * Based on maximum values assuming multi-junction structures. Shaded areas indicate materials handled by Flexell Space.
Source: NREL, Samsung Securities

Space solar cells: Comparison by applicable architectures

	Single junction	Multi junction	HJT	Tandem
Definition	Single Bandgap structure	Multi-Bandgap stacked structure (3J–4J)	Combined crystalline (c-Si) & amorphous (a-Si) silicon	Stacking solar cells of different wavelength bands
Typical material combinations	Silicon, GaAs, CIGS	InGaP/GaAs/Ge (3J), InGaP/GaAs/InGaAsP/ Ge (4J)	c-Si / a-Si	Perovskite/HJT, Perovskite/CIGS
Efficiency*	21-31%	33-48%	24-28%	23-36%
Specific power	Varies by material (CIGS is high)	Medium	Low	Medium to high
Technical maturity	High	High	Relatively high	Low to medium
Leo suitability	Unsuitable	Suitable, but burden of cost/mass	Unsuitable as standalone	Suitable
Role in space solar power	Supplementary structure	Dominant structure	Suitable for tandem bottom cells	Next-generation structure

Note: * Based on NREL standards; Shaded areas indicate architectures handled by Flexell Space.
Source: NREL, Samsung Securities

Global solar cells: Efficiency trends of perovskite tandem cells



Source: NREL

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