

Project Name: International Collaborative R&D for Low-Cost and High-Durability Solar Cells (2020–2023)



Entrusted party: National Institute of Advanced Industrial Science and Technology (AIST)

Outline of the project

To establish renewable energy as a primary power source, it is necessary to significantly expand the utilization of solar power generation. In this project, research and development of component cell technologies will be carried out to realize high-efficiency (>30%), low-cost, and high-durability perovskite/Si tandem solar cells.

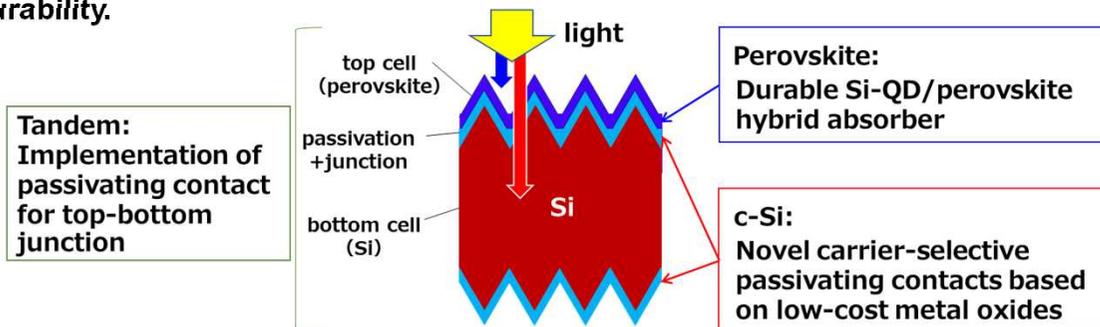
■ Challenge 1:

Although the tandem architecture built by combining different types of solar cells is key to achieving conversion efficiency of over 30%, it is difficult to build tandem architecture for commercial Si cells that use insulator or metal layers at both Si surfaces.

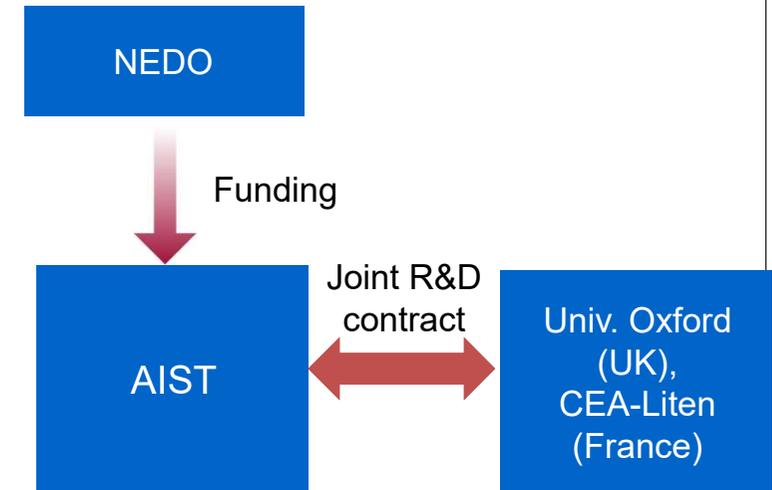
-> **Novel approach: Efficient passivating contacts based on low-cost metal-oxide layers that enable both surface passivation and carrier extraction.**

■ Challenge 2: The durability of perovskite solar cells has long been an issue.

-> **Novel approach: Si quantum dot-perovskite hybrid materials to improve durability.**



Project scheme



Expected outcomes

- Low-cost and high-durability perovskite/Si tandem solar cells can overcome the constraints of installation capacity and create new markets (e.g., replace existing PV panels, ZEB/ZEH, EVs).
- Contribute to further PV market penetration to make it a primary power source. (50–100 GW by 2050 in Japan)
- Expected CO₂ reduction: 0.03–0.06 Gtons-CO₂/year

Significance of international R&D

- The University of Oxford has expertise in interface characterization for metal-oxide/Si contacts, which is essential to improve the Si solar cells developed at AIST.
- CEA-Liten is capable of producing high-efficiency perovskite solar cells using a low-temperature process suitable for tandem cell application. AIST's QDs in perovskite will be integrated to improve performance durability.