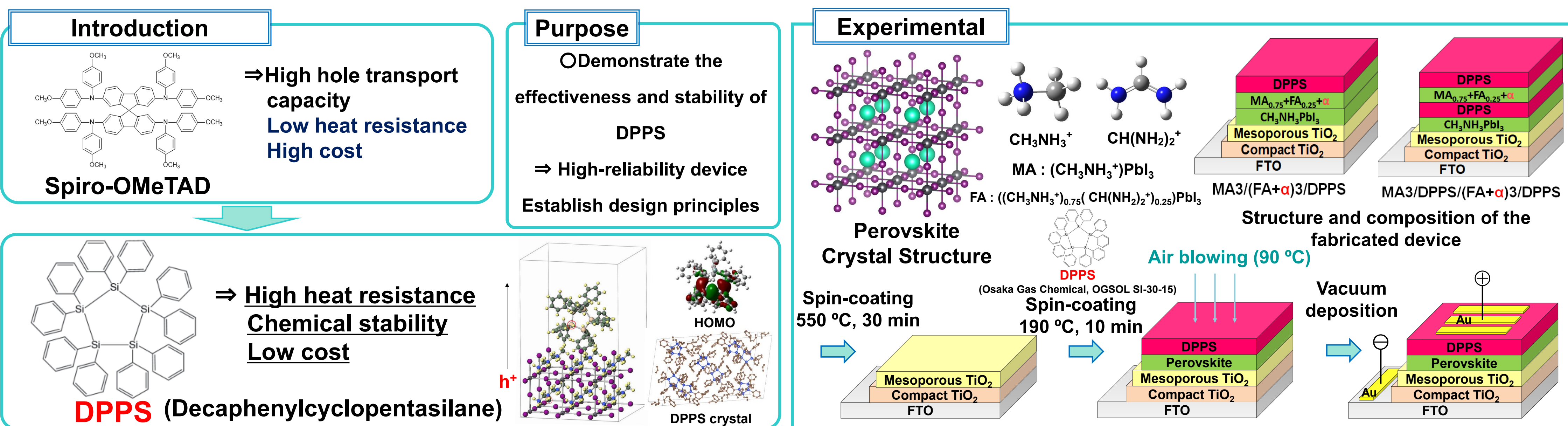
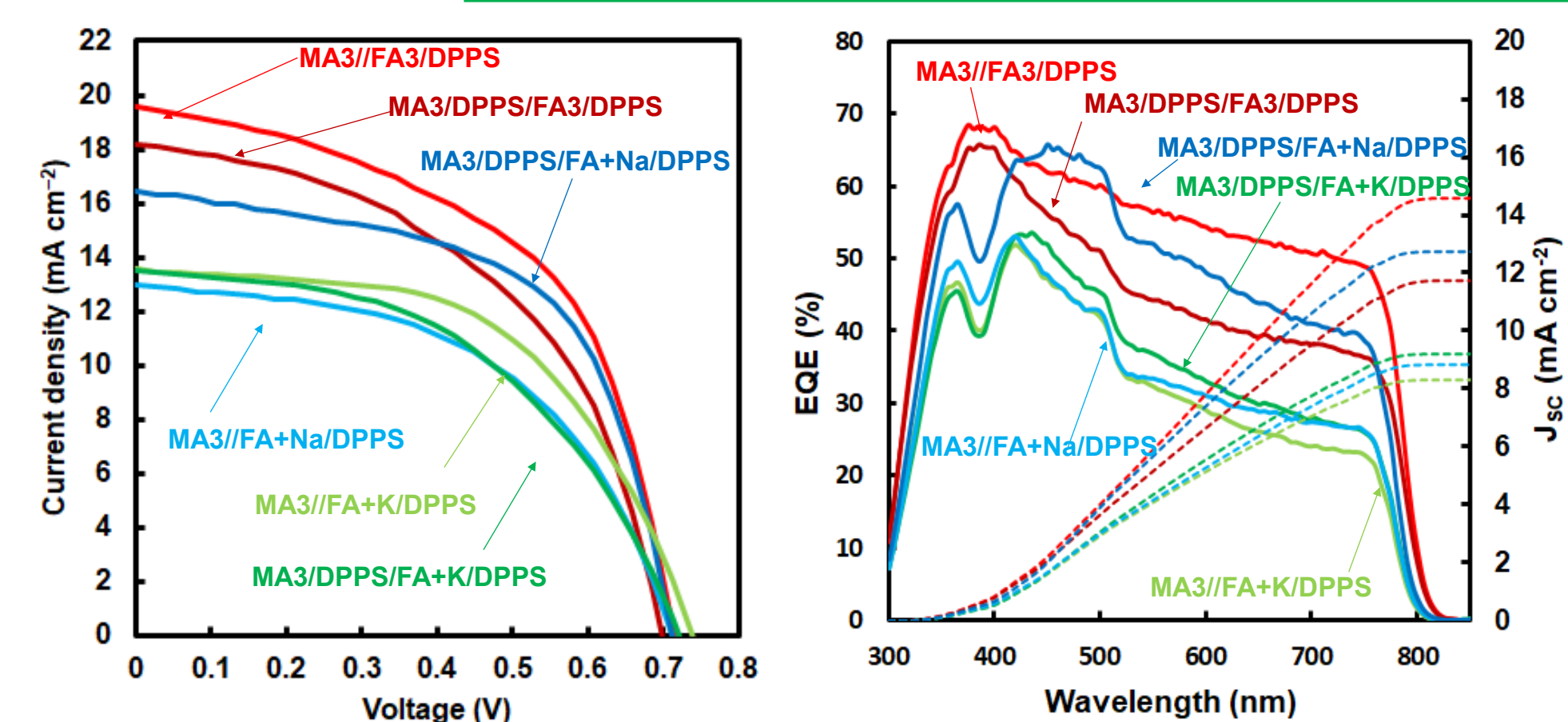


New stable hole transport material for perovskite solar cells: Decaphenylcyclopentasilane polysilane material

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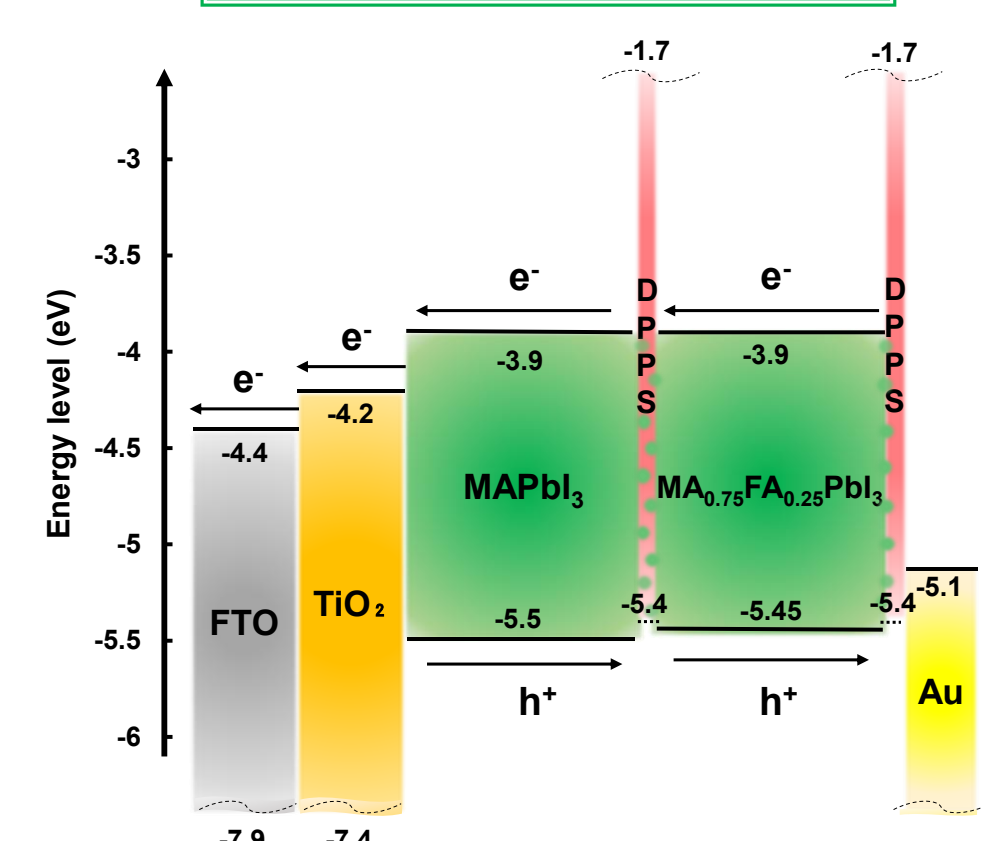
Current density-Voltage characteristics and External Quantum Efficiency



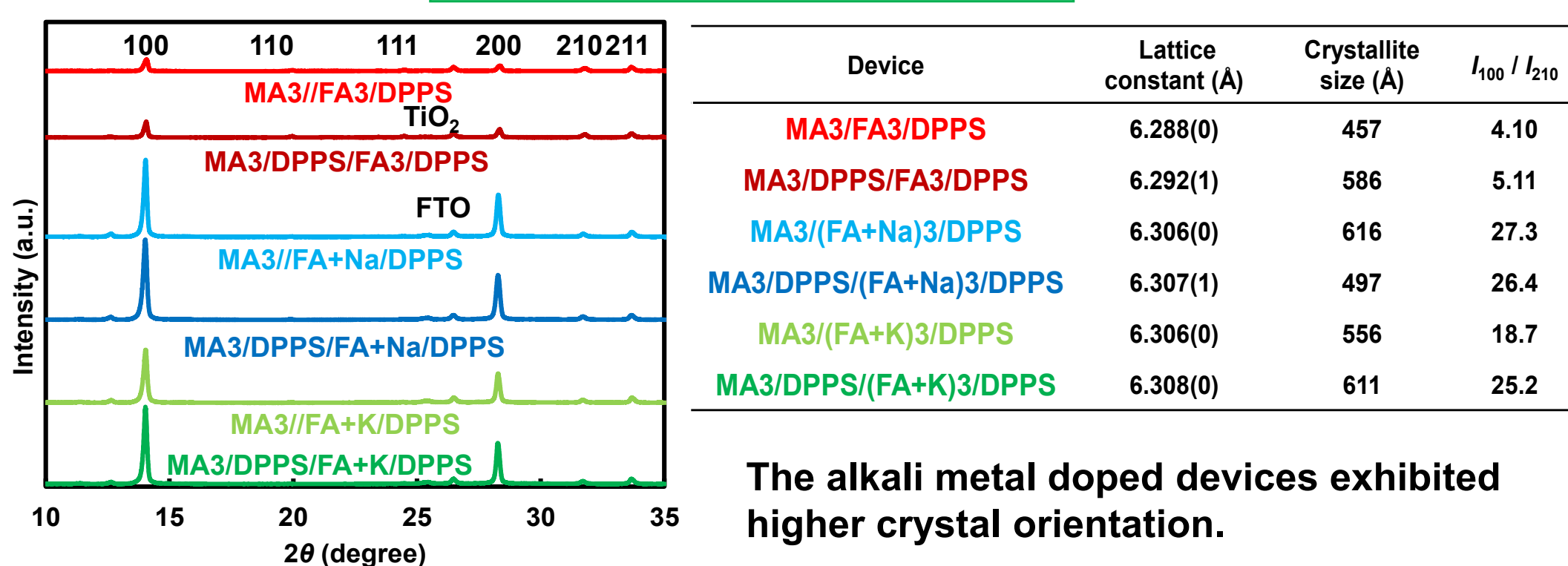
Device	J _{sc} (mA cm ⁻²)	V _{oc} (V)	FF	R _s (Ω cm ²)	R _{sh} (Ω cm ²)	η (%)	η _{ave} (%)
MA ₃ /FA ₃ /DPPS	19.5	0.714	0.529	3.45	255	7.38	3.33
MA ₃ /DPPS/FA ₃ /DPPS	18.2	0.699	0.492	2.50	274	6.25	3.01
MA ₃ /(FA+Na) ₃ /DPPS	13.0	0.712	0.515	3.87	396	4.76	3.31
MA ₃ /DPPS/(FA+Na) ₃ /DPPS	16.4	0.712	0.583	1.16	296	6.82	5.00
MA ₃ /(FA+K) ₃ /DPPS	13.6	0.738	0.548	4.00	754	5.49	1.95
MA ₃ /DPPS/(FA+K) ₃ /DPPS	13.5	0.721	0.489	5.92	393	4.76	2.82
MA ₃ /(FA+Rb) ₃ /DPPS	12.8	0.665	0.350	7.01	79.3	2.98	1.24
MA ₃ /DPPS/(FA+Rb) ₃ /DPPS	10.7	0.494	0.321	5.54	67.2	1.69	0.76
MA ₃ /(FA+Cs) ₃ /DPPS	12.3	0.628	0.303	15.9	66.9	2.33	1.24
MA ₃ /DPPS/(FA+Cs) ₃ /DPPS	14.1	0.618	0.323	12.7	59.4	2.81	1.90

⇒ MA₃//FA₃/DPPS and MA₃/DPPS/(FA+Na)₃/DPPS recorded high efficiency.

Energy level diagram

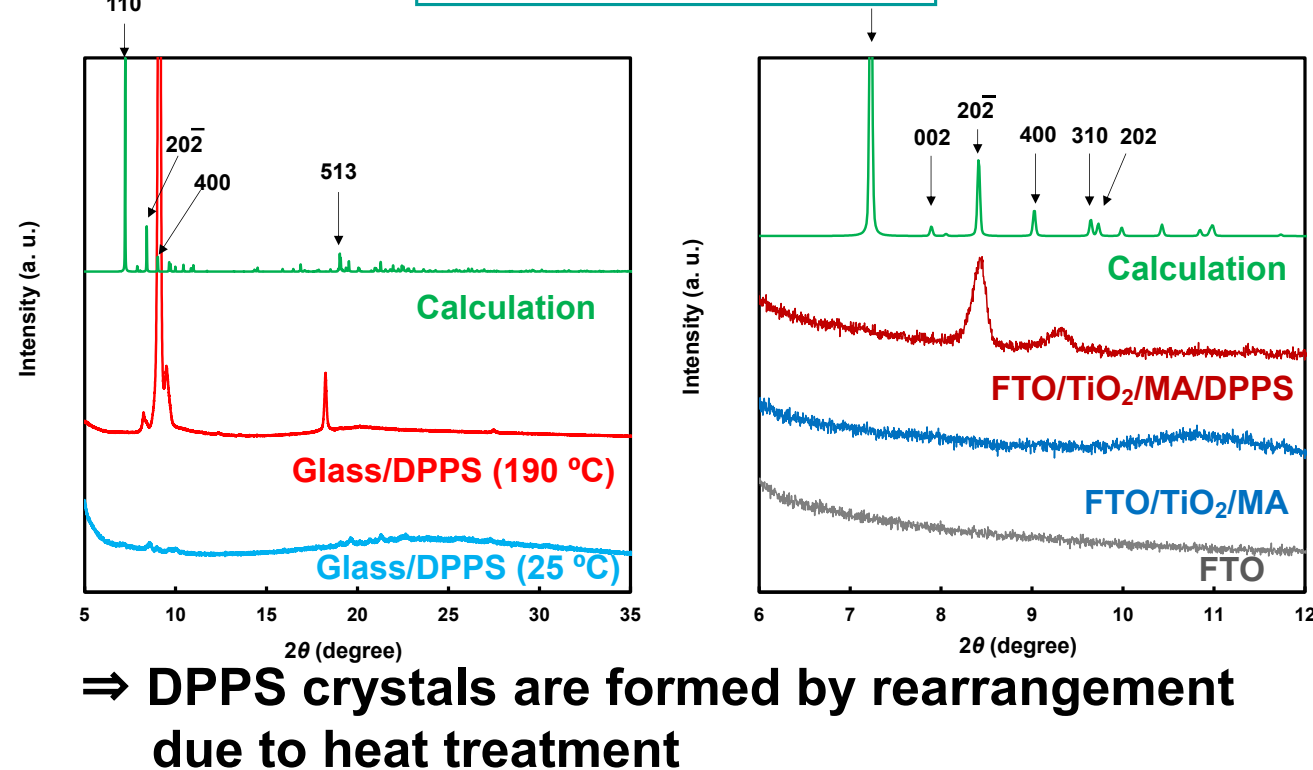


X-ray diffraction

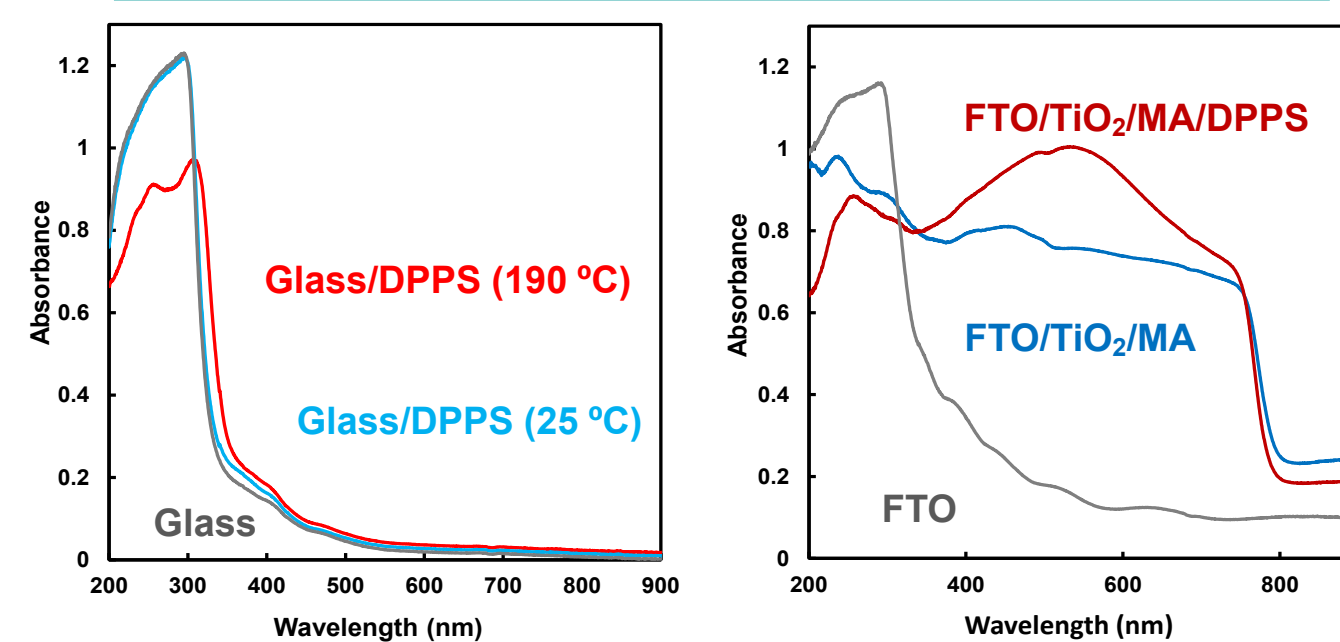


DPPS characteristics

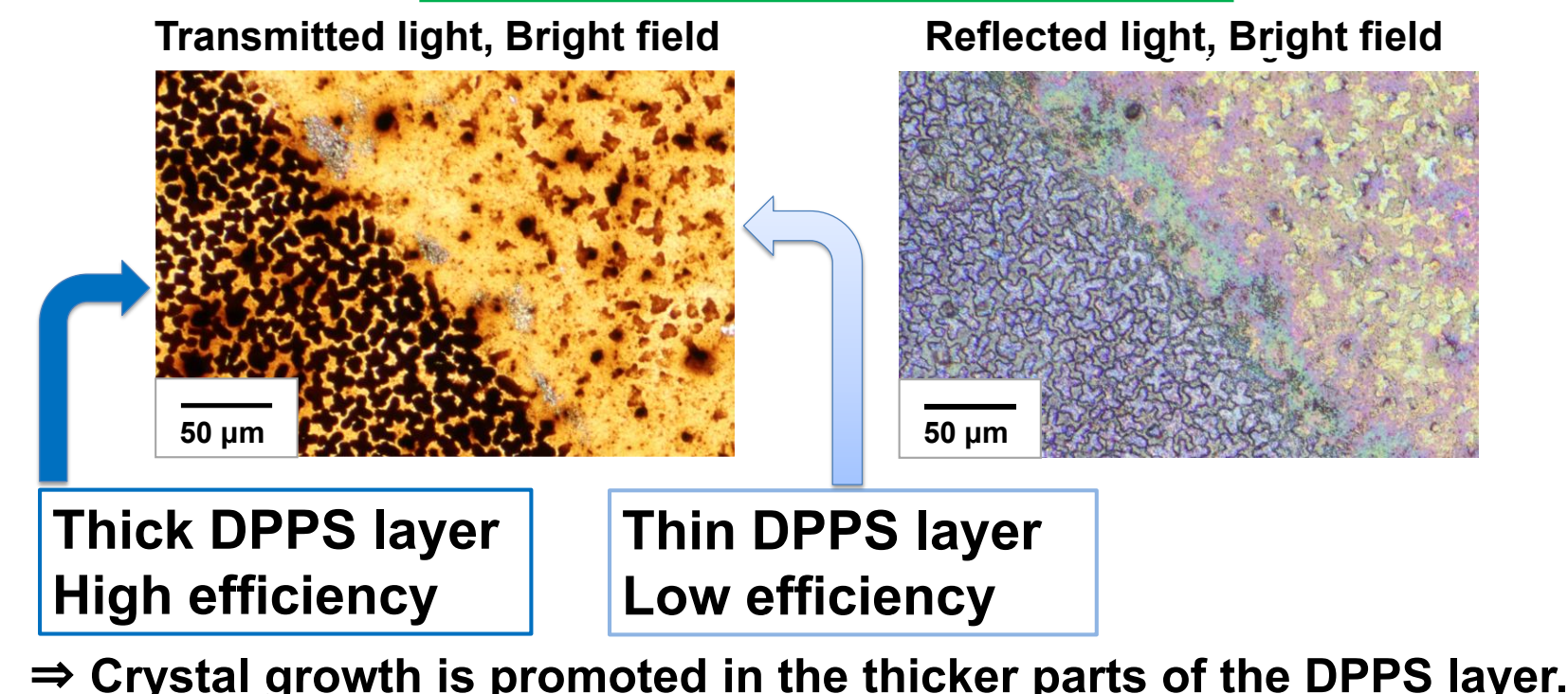
X-ray diffraction



Ultraviolet-visible-near Infrared spectroscopy



Optical microscope images



FUTURE WORK / REFERENCES

CONCLUSION

In the future, we aim to achieve conversion efficiency equivalent to that of Spiro-OMeTAD devices and even greater long-term stability with devices using DPPS as the hole transport layer.

T. Nasu, T. Oku, A. Suzuki, T. Tachikawa, S. Fukunishi, Fabrication and characterization of formamidinium-based perovskite photovoltaic devices hybridized with decaphenylcyclopentasilane hole transport layers, Hybrid Advances, 10 (2025) 100473. <https://doi.org/10.1016/j.hybadv.2025.100473>

It was revealed that DPPS functions as a hole transport layer, providing photoelectric conversion properties, and functions as a protective layer for the perovskite, improving long-term stability.

○ Examination of the microstructure on the device DPPS suggested that DPPS may prevent the desorption of MA from the perovskite and promote crystal growth during the crystallization process of the perovskite layer.