Supplementary Materials

Table S1. The lamination process parameters.

Sample Type	Sample	Vacuum Time/s	Lamination Pressure/kPa	Lamination Temperature/℃	Lamination Time/min
Module	Glass/EVA/SHJ/EVA/Glass	280	13	140	10
	Glass/dsEVA/SHJ/dsEVA/Glass	280	13	140	10
	Glass/POE/SHJ/POE/Glass	280	13	150	15
Encapsulant	EVA	280	13	140	10
	dsEVA	280	13	140	10
	POE	280	13	150	15

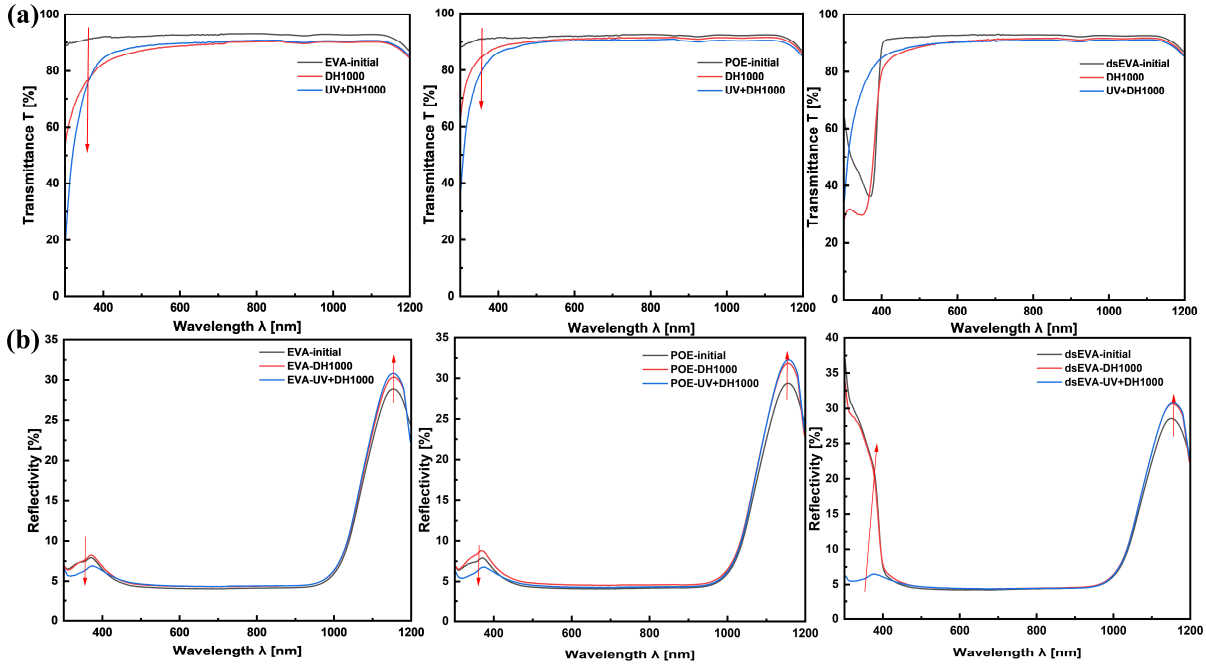

Figure S1. Changes in optical properties of three types of encapsulant films before and after aging. (**a**) Transmittance. (**b**) Reflectance.

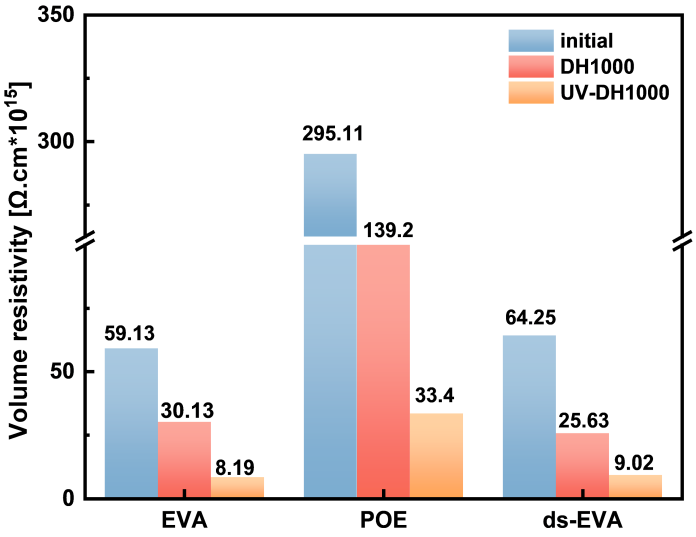

Figure S2. Changes in bulk resistivity of the three types of encapsulant films before and after aging.

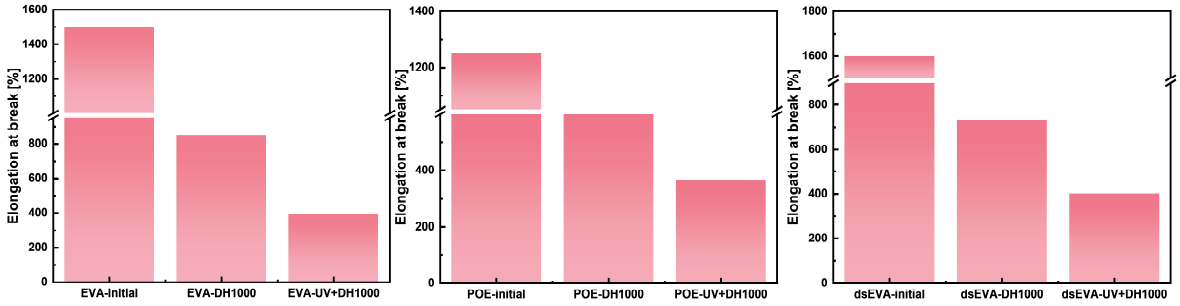

Figure S3. Changes in elongation at break of the three types of encapsulant films before and after aging.

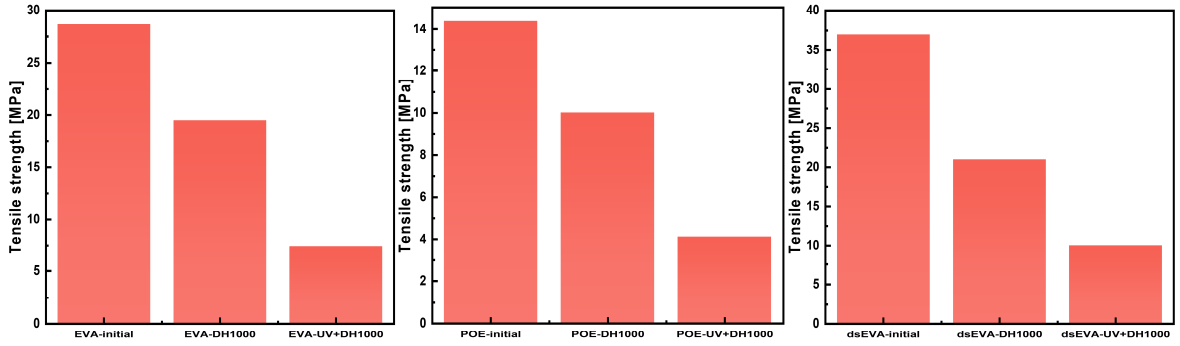

Figure S4. Changes in tensile strength of the three types of encapsulant films before and after aging.

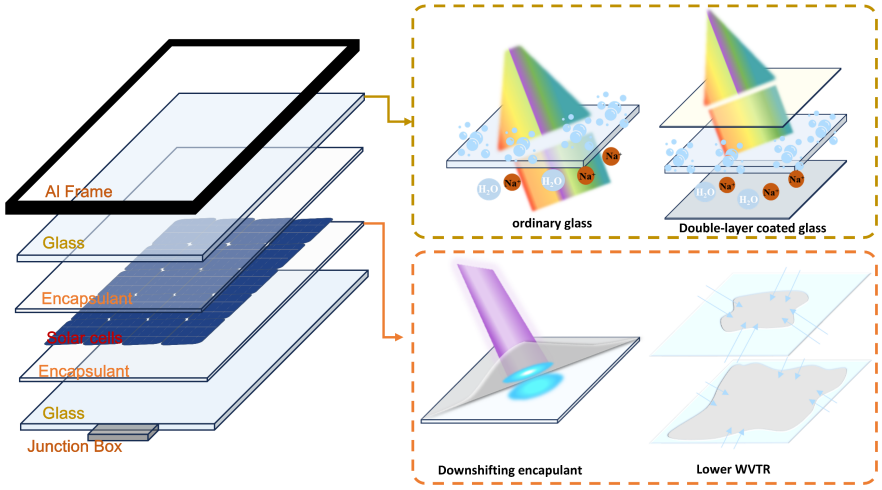

Figure S5. Optimization of encapsulant materials: bilayer coating glass and light-downshifting encapsulant film with low WVTR.