

Supporting Information

Evaporation of particle-stabilised emulsion sunscreen films.

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Table S1. Physical properties of PG, SQ and n-decane at 32°C (data from refs. 28-34).

solvent	Density/g cm ⁻³	Vapour pressure/Pa	Refractive index (at 589.3 nm)
PG	1.0276	50.8	1.429
SQ	0.8009	0.007	1.4425
n-decane	0.72106	280	1.4066

Figure S1. Comparison of the specular and diffuse UV spectra (all versus air as reference) of 100 μm path length PG-in-SQ emulsion films containing equal volumes of SQ and PG with and without AVB or MC. The films were stabilised using 1 wt% of 23% SiOH silica particles and the spectra were measured in closed cuvettes without evaporation. For the diffuse measurements, the instrument sensitivity limits the wavelength range to wavelengths greater than approximately 250 nm.

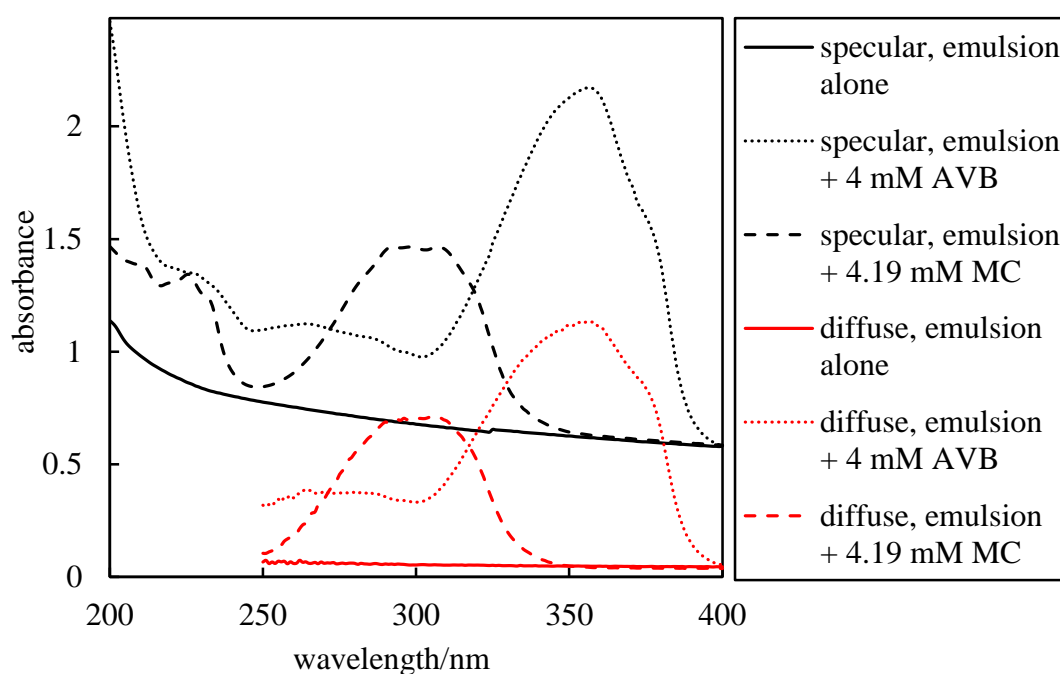


Figure S2. Upper plot: Calculated film absorbance due to scattering of PG-in-SQ and SQ-in-PG emulsion films of 100 μm thickness containing equal volumes of SQ and PG without UV filter. The calculations are for non-interacting droplets of mean radius 10 μm with a polydispersity (standard deviation/mean) of 30% with no multiple scattering. Lower plot: Scattering intensity (arbitrary units) versus scattering angle for the PG-in-SQ emulsion film at a wavelength of 300 nm.

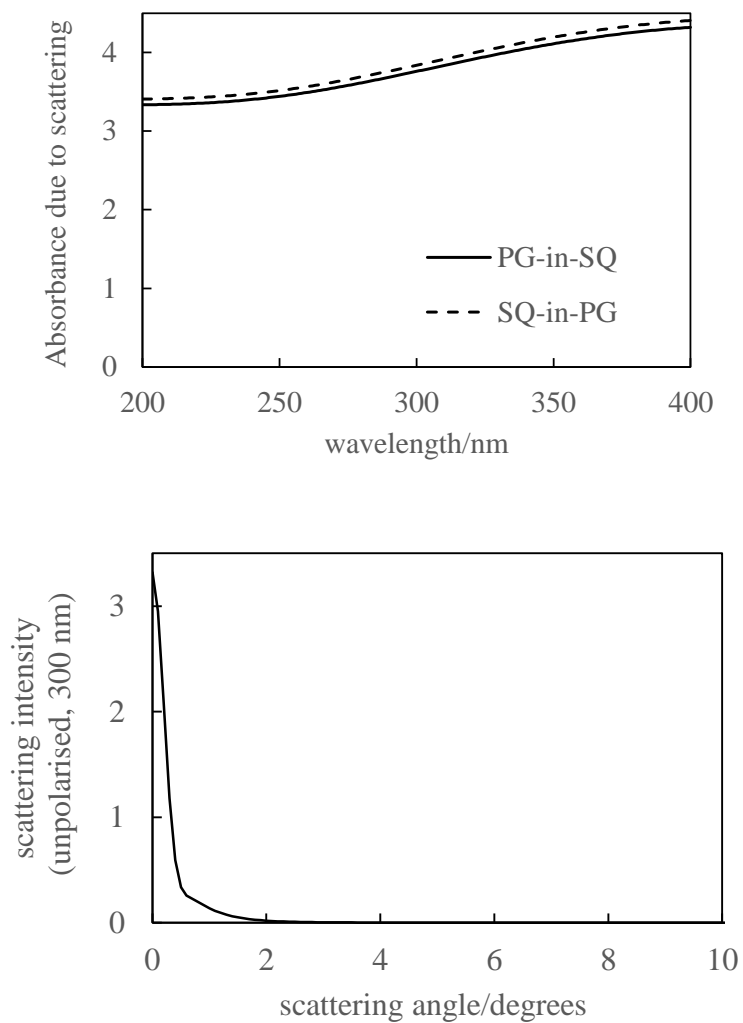


Figure S3. Variation of the volume fraction of PG with evaporation time for PG-in-SQ and SQ-in-PG emulsion films initially containing approximately equal volumes of SQ and PG and 4 mM AVB in the total emulsion.

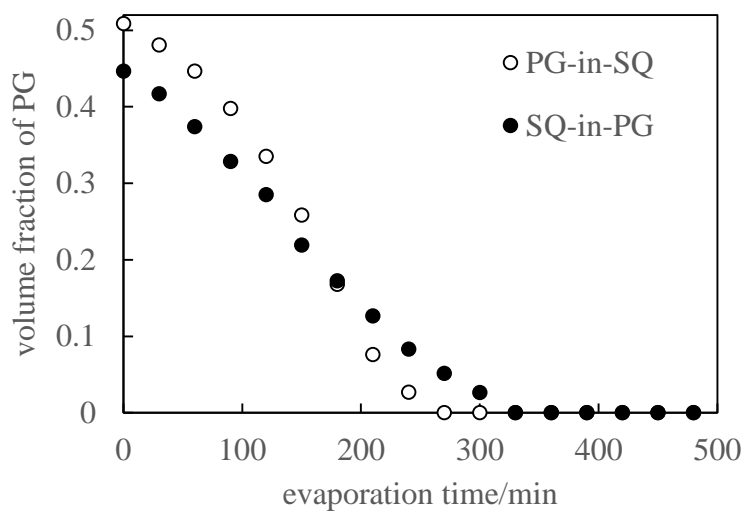


Figure S4. Variation of the specular absorbance at 400 nm wavelength with evaporation time for PG-in-SQ and SQ-in-PG emulsion films initially containing equal volumes of SQ and PG and 4 mM AVB in the total emulsion.

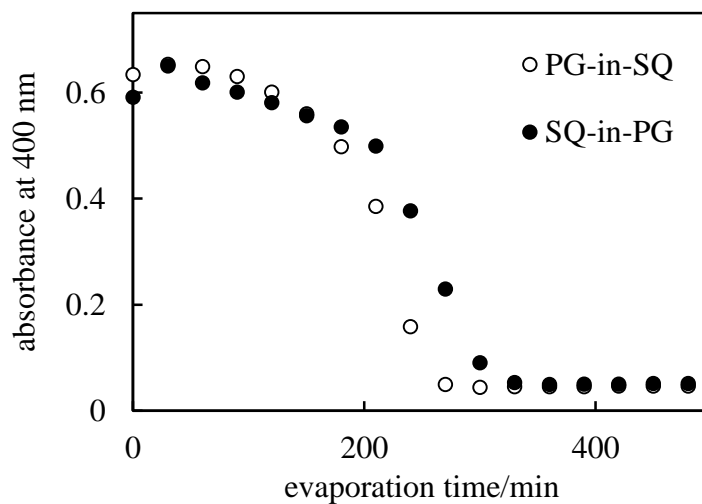


Figure S5. Measured (upper plot) and calculated (lower plot) UV spectra versus air as reference during evaporation of a PG-in-SQ emulsion film initially with 13.7 mg mass and containing equal volumes of SQ and PG and 4.19 mM MC in the total emulsion (initially dissolved in the PG phase). The film was stabilised using 1 wt% of 23% SiOH silica particles.

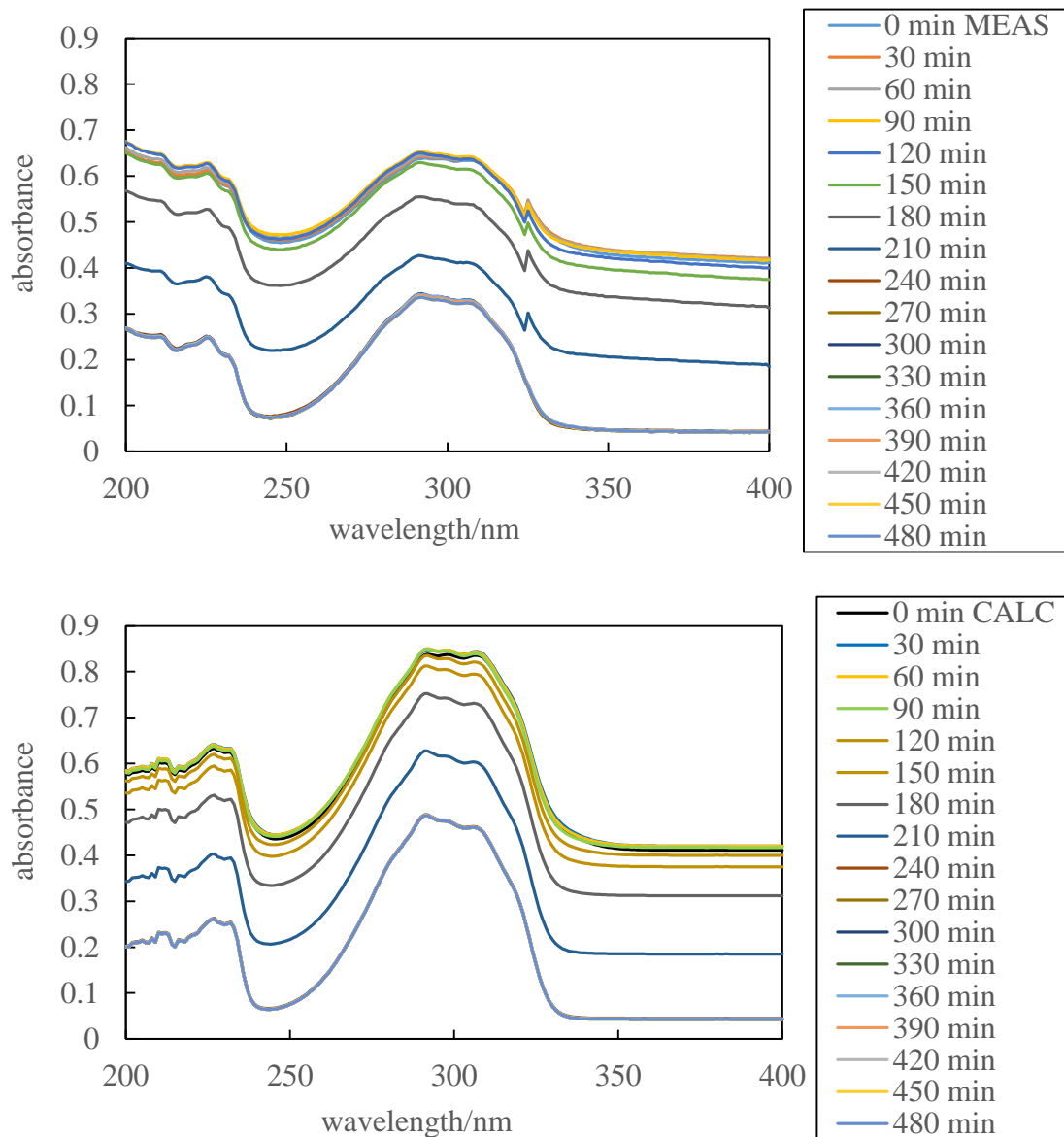


Figure S6. Measured (upper plot) and calculated (lower plot) UV spectra versus air as reference during evaporation of a SQ-in-PG emulsion film initially with 15.7 mg mass and containing equal volumes of SQ and PG and 4.19 mM MC in the total emulsion (initially dissolved in the PG phase). The film was stabilised using 1 wt% of 35% SiOH silica particles.

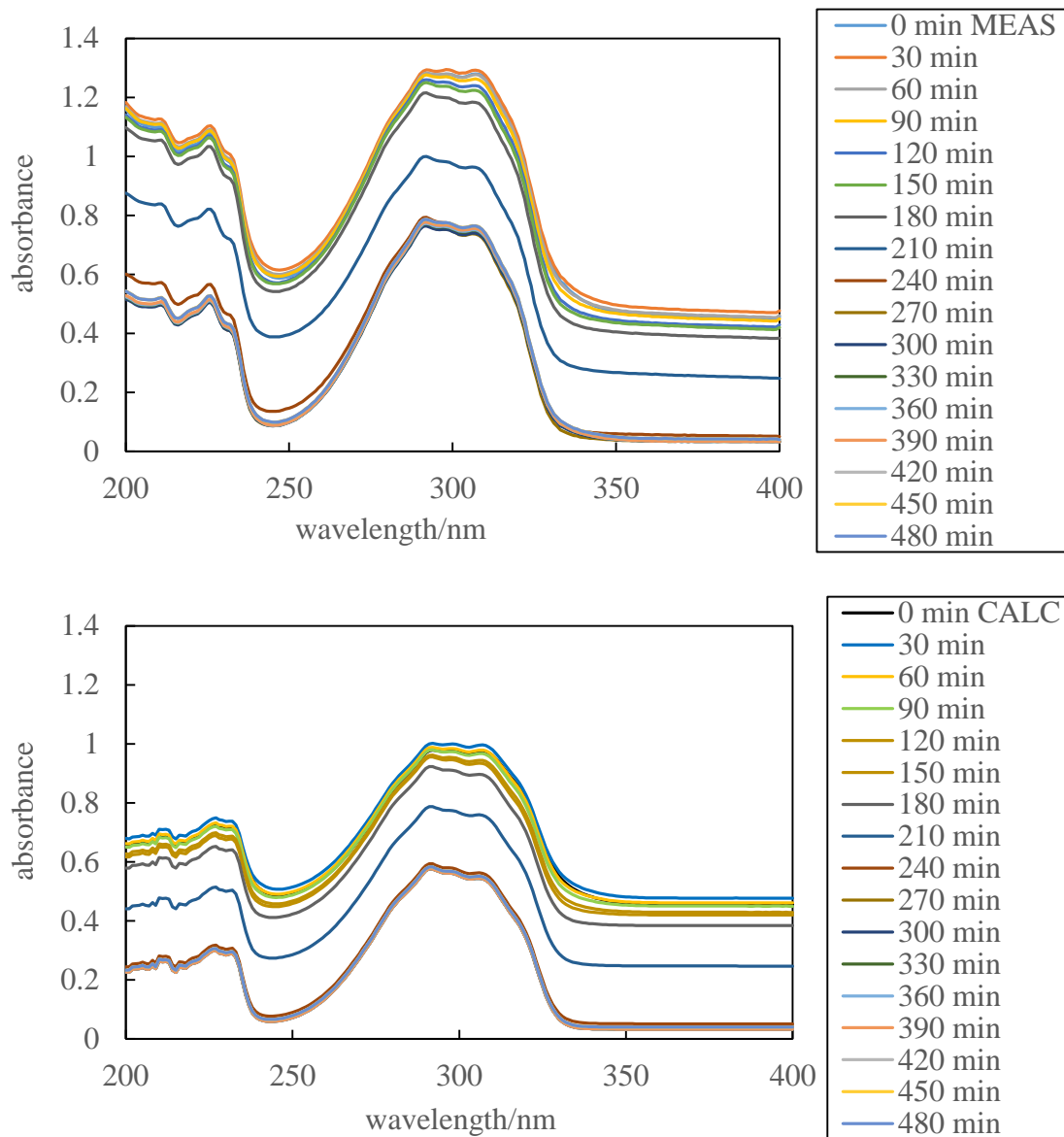


Figure S7. Overall film area images of an evaporating film of a decane-in-PG emulsion initially containing equal volumes of decane and PG with 4 mM AVB. The emulsion was stabilised by 1 wt% of 23% SiOH silica particles. The red rectangles show the area illuminated in the spectrophotometry measurements.

