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Disposal of Energy by UV-B Sunscreens[1] THOMAS NORDLUND, Dept. of Physics, Univ. of Alabama/Birmingham, RAJAGOPAL KRISHNAN, Dept. of Dermatol., Univ. of California/SF — Ideal sunscreens absorb dangerous UV light and dispose of the energy safely. "Safe disposal" usually means conversion to heat. However, efficient absorption entails a high radiative rate, which implies high energy-transfer and other rates, unless some process intervenes to "defuse" the excited state. We studied the excited-state kinetics of three UV-B (290-320 nm) sunscreens by absorption, steady-state and time-resolved fluorescence. Excited-state rate analysis suggests that some sunscreens have low radiative-rate "dark" states, in addition to normal excited states.* We deduce dark states when sunscreens of high extinction coefficient do not show lifetimes and total emission consistent with such high radiative rates. A high radiative rate, accompanied by efficient fluorescence emission and/or transfer, may be unfavorable for a sunscreen. In spite of its dark excited state, padimate O shows significant re-emission of light in the UV-A (320-400 nm) and energy transfer to a natural component of excised skin, probably collagen.
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