Synopsis of Original Research Paper

Development of Novel UVA-UVB Hybrid Sunscreen Based on Proximity Effect

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The synthesis and photophysical properties of *N*-hydroxyethyl-*o*-aminoactophenone (HEAAP), and UVA-UVB hybrid compound (MBCE-HEAAP, MNCE-HEAAP) based on HEAAP and UVB absorbers have been studied by using fluorescence and time-resolved photoacoustic method. The absorption band of HEAAP in solution is observed at UVA region. The fluorescence quantum yield (Φ_f) of HEAAP depends on the nature of the solvent. In *n*-hexane, HEAAP gives very smallΦ_f value ($\Phi_f = 4.5 \times 10^{-4}$), suggesting the presence of very fast nonradiative deactivation processes. The measurement of the quantum yield of the intersystem crossing of HEAAP based on the photoacoustic method clearly shows that the fast radiationless processes in *n*-hexane are due to internal conversion. This efficient $S_1 \rightarrow S_0$ internal conversion arises from vibronic interaction between close-lying $^1(\pi,\pi^*)$ and $^1(n,\pi^*)$ states (the proximity effect). For MBCE-HEAAP and MNCE-HEAAP, these absorption bands are observed at UVB and UVA region. The fluorescence intensity of MBCE or MNCE decreases extremely showing that effective energy transfer from MBCE or MNCE unit to HEAAP moiety occurs. The photostability of MBCE-HEAAP in *n*-hexane is higher than that of methoxycinnamic acid ethyl ester which is typical UVB sunscreen. These results suggest that UVA-UVB hybrid compound has a high potential for the sunscreen.