



Elucidating Medicinal Effects of Curcumin through Understanding of Excited State Photophysics

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Curcumin is the naturally occurring yellow-orange pigment found in the Indian spice turmeric and its medicinal properties have been documented in ancient literature. Recent research shows that curcumin possesses antioxidant, anti-inflammatory, anticancer, anti-Alzheimer's disease, wound healing and other health effects. One of the most exciting applications of curcumin is its potential to be an effective photodynamic therapy agent for the treatment of melanoma, as studies have shown. This application warrants the investigations of the excited state photophysics of curcumin. In our studies, femtosecond fluorescence upconversion spectroscopy was employed to investigate the excited state behaviour of curcumin. The time-resolved fluorescence of curcumin in methanol exhibits two decay components with time scales of 12 ps and 70 ps. Upon deuteration of curcumin, while the fast component remains unchanged, the slow component shows a prominent isotope effect. The results strongly support that curcumin undergoes excited state intramolecular hydrogen atom transfer (ESIHT). Additionally, the results also indicate that ESIHT is the major photophysical process that controls the excited state lifetime of curcumin. The implication of medicinal effects of curcumin due to ESIHT will also be discussed.