

Photostability of the Building Blocks of Life

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Stability with respect to photochemical destruction by ultraviolet light is a decisive property of biological molecules. Recent excited-state electronic-structure calculations and time-dependent quantum wave-packet calculations of the nuclear motion have revealed the role of conical intersections of electronic potential-energy surfaces in the highly efficient excited-state deactivation in biological molecules such as aromatic amino acids and DNA bases. Evidence is provided that specific electron-driven proton-transfer processes play a universal role in the photochemistry of biomolecules and biopolymers (DNA and proteins). These processes may be the origin of the exceptional photostability of these compounds which has led to their selection at the very beginning of the biological evolution.