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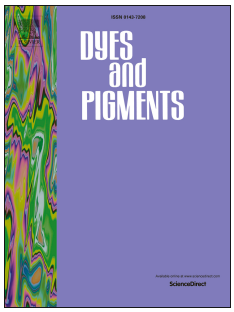

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Comprehensive exploration of the optical and biological properties of new quinolines based cellular probes

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Abstract

A series of quinoline derivatives containing bithiophene and *N*-octyl-carbazole moieties and a variety of substituents in the quinoline core were synthesized and characterized. The influence of bithienyl and *N*-octyl-carbazyl substituents on the photophysical properties of novel quinolines were thoroughly investigated and supported by DFT calculations. The absorption and emission maxima of quinolines are located at 373-412 and 410-606 nm, respectively, which considerably red-shifts when an electron-withdrawing substituent (NO_2) is introduced to the quinoline ring. The quantum yield and lifetime for carbazyl-substituted quinolines are considerably higher (Φ_{em}=9-70%, τ=0.83-5.72 ns) compared to their bithiophene substituted counterparts (Φ_{em}=18-53%, τ=0.61-1.46 ns) resulting from greater planarity of carbazyl-substituted quinolines as proved by theoretical calculations. The carbazyl functional group in quinolines has immense impact on values of $\Delta\mu$ (13.83-15.50 D) indicating that the electron-donating ability of carbazole moiety relative to bithiophene motif ($\Delta\mu$=9.16-13.83) in studied quinolines is more predisposed to intramolecular charge transfer (ICT). The capability of the novel compounds for cellular staining was investigated. All examined quinoline derivatives penetrate cell organelles quickly and efficiently with good overall fluorescence and signal to noise ratio. Relative lack of toxicity make them useful in such applications.