Black Hole Quencher-1 (BHQ-1) is classified as a dark quencher (a non-fluorescent chromophore), and is extensively used as the 3’-quencher moiety in a variety of Fluorescence Resonance Energy Transfer (FRET) DNA detection probes. Such probes are primarily used in nucleic acid assays, but also find a place in nucleic acid structural studies (1). Examples include TaqMan probes (2), Scorpion primers (3), and Molecular Beacons (4).

BHQ-1 has an absorbance maximum of 534 nm, and an effective absorbance range of 480-580 nm. It is the preferred quencher for pairing with fluorescent dyes that emit in the yellow-green to yellow part of the visible range (519-556 nm). The emission spectra of this set of dyes sufficiently overlaps the absorbance spectrum of BHQ-1 to allow the latter to quench the fluorescence of the former with a high degree of efficiency.

The advantages of using a dark quencher in a FRET probe are (a) low background fluorescence (and thus better signal-to-noise ratio), (b) higher dynamic range, (c) amenability to multiplex assays (due to a dark quencher having no secondary fluorescence), and (d) ease of synthesis of FRET probes with a dark quencher (due to dark quenchers being resistant to degradation during the oligo deprotection step) (5).

Quencher Spectral Data

Quencher

Absorption Max, nm

Quenching Range, nm Dabcyl 453 380-530 BHQ-0 495 430-520 BHQ1 534 480-580 BHQ2 579 550-650 BHQ3 672 620-730 BBQ-650 650 550-750 Click here for complete list of quenchers

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References