Qdot® ITK™ Carboxyl Quantum Dots

Catalog nos. Q21341MP, Q21391MP, Q21331MP, Q21311MP, Q21301MP, A10200, Q21321MP, Q21361MP, Q21371MP

Table 1. Contents and storage information.

Material	Amount	Concentration	Storage	Stability
Qdot® ITK™ carboxyl quantum dots	250 µL	8 µM solution in 50 mM borate, pH 9.0	• 2–6°C • Do not freeze	When stored as directed the product is stable for at least 6 months.
Approximate fluorescence excitation/emission spectra: See Figure 2.				

Introduction

Structure of Qdot® Nanocrystals

Qdot® ITK™ (Innovator's Tool Kit) carboxyl quantum dots are made from nanometer-scale crystals of a semiconductor material (CdSe), which are shelled with an additional semiconductor layer (ZnS) to improve their chemical and optical properties. The Qdot® 705 and Qdot® 800 nanocrystals, which include CdSeTe, are made in a similar fashion. These materials have narrow, symmetric emission bands with emission maxima near 525 nm, 565 nm, 585 nm, 605 nm, 625 nm, 655 nm, 705 nm, or 800 nm. This core-shell material (Figure 1A) is further coated with a polymer layer that allows facile dispersion of the quantum dots in aqueous solutions with retention of their optical properties. The polymer coating has $-COO^-$ surface groups available for modifications such as macromolecule attachment (Figure 1B). Qdot® ITK™ carboxyl quantum dots are about the size of a large macromolecule or protein.

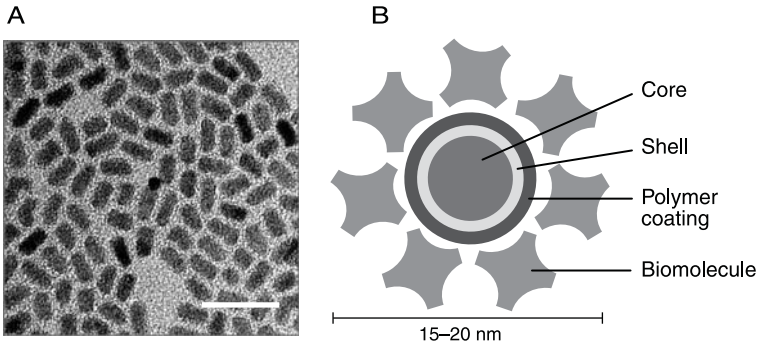

Figure 1. A. Transmission electron microscope image of core-shell Qdot® nanoparticles at 200,000x magnification. Scale bar = 20 nm. **B.** Schematic of the overall structure of a Qdot® conjugate. The layers represent the distinct structural elements of the Qdot® nanocrystal conjugates, and are roughly to scale.

Optical Properties

The optical properties of Qdot® nanocrystals are different from those of typical organic dye molecules. The colors of light that Qdot® nanocrystals emit are strongly dependent on particle size, creating a common platform of fluorescent labels emitting from green to the near IR, all manufactured from the same underlying semiconductor material (see *Bibliography*, references 1–11 in the *Appendix*). The size of Qdot® nanocrystals is tightly controlled in the production process, resulting in materials with narrow and symmetric emission bands and that are extremely bright and photostable. While the fluorescence emission bands from the Qdot® 705 and Qdot® 800 nanocrystals are broader than the emission bands of the visible wavelength Qdot® nanocrystals, all the Qdot® fluorophores have strong emission intensity and superior photostability. Note that Qdot® 705 and 800 nm emissions cannot be seen by eye, but are easily detected by many cameras and detectors. These properties are exploited in a variety of immunofluorescence techniques, and can result in substantially better results than are attainable with conventional fluorescent labels (see *Bibliography*, references 12–18). Though these materials are compatible with a number of standard fluorescence techniques, there are some novel aspects of their chemistry and detection that require careful consideration to obtain optimal results.

Spectral Characteristics

Organic fluorescent dyes have excitation and emission spectra with a relatively small Stokes shift, which means that the optimal excitation wavelength is close to the emission peak. Filter sets used with fluorescent dyes reflect this characteristic.[19] Light absorption efficiency of Qdot® nanocrystals increases dramatically to the blue of the emission (Figure 2). These unique spectral properties are due to the semiconductor material that makes up the core of the Qdot® nanocrystals, which gives rise to both their absorption and emission properties. (see *Bibliography*, references 1–11). Despite their broad wavelength range of light absorption, the emission wavelength of these materials is independent of the excitation wavelength. For example, whether exciting at 400 nm or 633 nm, the shape of the emission band of Qdot® 655 nanocrystals remains the same, while the intensity is approximately 11-fold higher with 400 nm excitation. Light absorption and consequent excitation at shorter wavelength, with fixed emission, results in a large "apparent Stokes shift." Short wavelength excitation improves sensitivity by reducing autofluorescence and takes advantage of the inherently greater light absorption of these materials in the blue to violet spectral region, greatly simplifying simultaneous, multiplexed detection of several Qdot® nanocrystal colors. See *Appendix* 3 for extinction coefficients of the different materials at common excitation wavelengths.

Optical Filter Selection

To achieve the optimal signal from Qdot® conjugates, we recommend using Qdot® optimized filter sets that are available from Omega Optical, Semrock, or Chroma Technology Corporation (see *Appendix 2* for details).

Qdot® conjugates can also be viewed through some standard filter sets, albeit with lower detection efficiency and reduced brightness. For example, three Omega Optical standard filter sets capable of detecting Qdot® 705 conjugates are XF140-2 (Alexa Fluor® 633 & Alexa Fluor® 647), XF70 (Alexa Fluor® 660 & Cy5), and XF141-2 (Cy5.5). Visualization of Qdot® conjugates using a custom filter set is preferred because excitation and detection is less efficient using filters that have not been selected specifically for use with Qdot® conjugates. Using a custom filter set, Qdot® 605 conjugate signal is approximately five times as bright as it is using the TRITC filter set, and approximately ten times brighter than it is using the Texas Red®/Cy3.5 filter set (Figure 3). Qdot® optimal filters and standard filter sets are available from different filter manufacturers. *Appendix 2* illustrates some common filter sets and the optimal filter set recommendations for the available Qdot® conjugates. Use of the optimal filter set is critical for attaining optimal signal and sensitivity in your experiments.

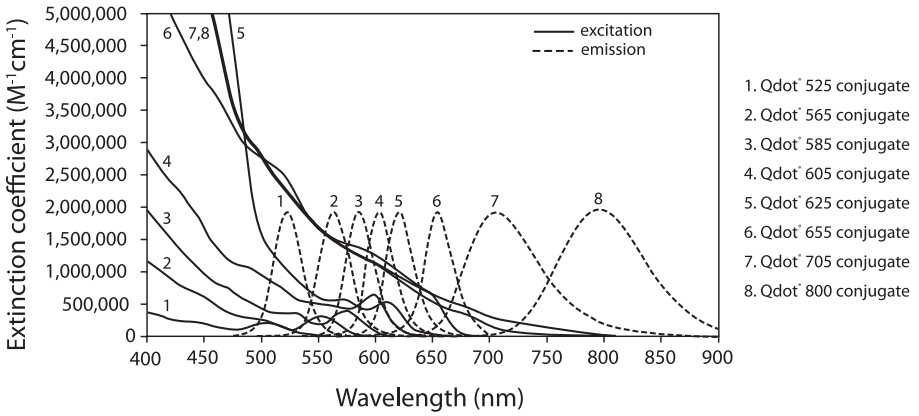

Figure 2. Typical absorption and emission spectra of Qdot® 525 conjugate (1), Qdot® 565 conjugate (2), Qdot® 585 conjugate (3), Qdot® 605 conjugate (4), Qdot® 625 conjugate (5), Qdot® 655 conjugate (6), Qdot® 705 conjugate (7), Qdot® 800 conjugate (8).

Before You Begin

Qdot® nanocrystals have chemical and optical properties that provide significant advantages over conventional fluorophores in both sensitivity and stability in fluorescent labeling and tracking applications. Qdot® ITK™ carboxyl quantum dots are used in a wide variety of labeling and tracking applications, including preparation and use of peptide derivatives,[20] nucleic acid conjugates,[21,22] polysaccharide conjugates,[23] in stem cell tracking[24] and for other uses in which ultrabright and stable fluorescence is desired.

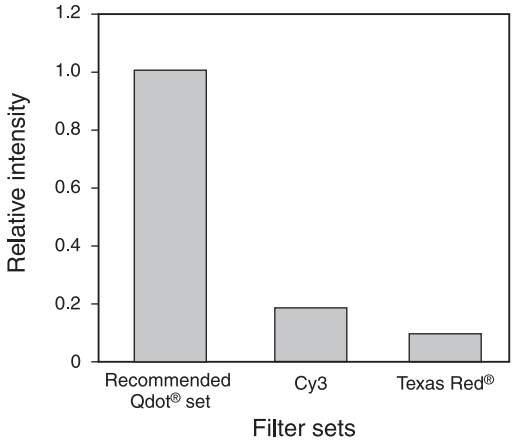

Figure 3. Detection of Qdot® conjugates on tissue sections with recommended and standard filter sets. Mouse kidney sections were stained with Qdot® 605 conjugate, and then images were collected on a Nikon epi-fluorescence microscope in 16 bit capture mode. The mean fluorescence of positively stained samples was extracted using Scion Image software. The recommended Qdot® filter set included a 460 nm short pass exciter, a 475 nm dichroic, and a 605/20 nm band pass emitter. The Cy3 filter set included a 545/30 nm exciter, a 570 nm dichroic, and a 610/75 nm emitter. The Texas Red® filter set included a 560/40 nm exciter, a 595 nm dichroic, and a 630/60 nm emitter.

For additional applications such as immunocytochemistry, tissue section staining, western blotting, as well as multiplexing using Qdot® streptavidin and secondary antibody conjugates, download the Qdot® Conjugates Protocol Handbook from www.invitrogen.com. For additional information and useful protocols for various applications with Qdot® nanocrystals and their conjugates, see Quantum Dots: Applications in Biology (Methods in Molecular Biology).[25]

Note: The near infrared 705 and 800 nm quantum dot emissions cannot be seen by eye, but are easily detected by many cameras and detectors.

General Considerations

Buffer compatibility

In our experience, Qdot® ITK™ carboxyl quantum dots and many of their conjugates have stable emission in a number of buffers, and the quantum yield and colloidal dispersion of conjugates made with these materials has been found to be stable at physiological and near-physiological pH (not investigated outside this range) in Tris, HEPES, phosphate, and borate buffers. In addition, a number of surfactants and additives such as Tween 20, Triton® X-100, and EDTA, among others, have been shown to maintain nanocrystal fluorescence when used at up to 0.5% concentration. We recommend storage of the Qdot® ITK™ carboxyl quantum dot product at the concentration at which it is shipped, rather than at high dilution. Storage of Qdot® ITK™ carboxyl quantum dots and their macromolecule conjugates at working dilution may result in substantial performance degradation. While we have not characterized the stability of all Qdot® ITK™ carboxyl quantum dots under all of these conditions, we anticipate similar levels of stability across the range of product colors.

Qdot® nanocrystal toxicity

We have not investigated the toxicity of Qdot® ITK™ carboxyl quantum dots. The materials are provided in a solution which is ~2 mM total Cd concentration; however, the CdSe core is encapsulated in a crystalline shell of ZnS and the amphophilic polymer coating, which may help prevent formation of free Cd. We have demonstrated the utility of these materials in a variety of live-cell *in vitro* labeling experiments, but do not have systematic data on the toxicity of the materials to humans, to animals, or to cells in culture.

FRET or close-proximity quenching

We have not systematically investigated the energy transfer properties of the Qdot® nanocrystals, though they may have useful properties as energy transfer donors and acceptors. We have investigated the fluorescence of Qdot® 605 conjugates which are coupled to each other through a bis-biotin linker, and found that the emission intensity of the materials was unperturbed at any concentration of biotin cross-linker. These results suggest that the interparticle quenching of these Qdot® conjugates is negligible. Published literature indicates that Qdot® nanocrystals can be used as energy acceptors in time-resolved FRET (TR-FRET) studies.[26]

Disposal of Qdot® Conjugate

The Qdot® conjugate contains cadmium and selenium in an inorganic crystalline form. Dispose of the material in compliance with all applicable local, state, and federal regulations for disposal of these classes of material. For more information on the composition of these materials, consult the Material Safety Data Sheet.

Conjugating Qdot® ITK™ carboxyl quantum dots

A protocol for conjugating streptavidin to Qdot® ITK™ carboxyl quantum dots is supplied below. You can use similar methods to conjugate other proteins and biomolecules of interest, providing they are compatible with the coupling chemistry described below or with alternate conjugation chemistry under consideration. The amounts suggested below may need to be adjusted to accomodate your conjugation requirements.

Conjugation of Qdot® ITK™ Carboxyl Quantum Dots to Steptavidin

Materials Required but Not Provided

- 10 mg N-ethyl-N'-dimethylaminopropyl-carbodiimide (EDC)
- 10 mg/mL Streptavidin (Invitrogen Cat. no. S888) in 10 mM borate buffer, pH 7.4
- 10 mM borate buffer, pH 7.4
- 50 mM borate buffer, pH 8.3
- Ultrafiltration units with 100 kDa cutoff, size 4 mL (Amicon Ultra-4 —Millipore Cat. no. UFC810008) or size 15 mL (Amicon Ultra 15—Millipore Cat. no. UFC910008)
- Filter syringes: Acrodisc® 25 mm PF Syringe Filter with 0.8/0.2 µm Supor® Membrane or Acrodisc® Syringe Filter 0.2 µm Supor® Membrane Low Protein Binding Non Pyrogenic
- PES (polyethersulfone) syringe filters, 0.2 µm (Whatman Cat. no. 6876-2502)

Preparing Streptavidin Solution

Prepare a 10 mg/mL streptavidin solution in 10 mM borate buffer, pH 7.4. Mix well. You will need 80 nmol of streptavidin for the conjugation reaction.

Amount

The molar concentration of each reagent used during the conjugation protocol is described below. Use these concentrations for the initial experiments and based on your results, you may need to optimize these concentrations to obtain the desired level of conjugation.

Reagent	Concentration	Equivalent
Qdot® Reagent	2 nmol (250 µL at 8 µM concentration)	1
Streptavidin	80 nmol (0.12–4.8 mg at 10 mg/mL)	40
EDC	3000 nmol (0.57 mg at 10 mg/mL)	1500

Experimental Protocol

Conjugation Protocol

Please read the entire protocol before starting.

1.1 In a small glass vial with a small stirbar, dilute 250 µL of 8 µM stock solution of Qdot® ITK™ carboxyl quantum dots to 2 mL using 10 mM borate buffer, pH 7.4. Mix well by stirring.

1.2 Add 0.48 mL of 10 mg/mL streptavidin to the Qdot® ITK™ carboxyl quantum dots reagent (step 1.1). Continue stirring.

1.3 Weigh ~5 mg of EDC in a 1.5 mL microcentrifuge tube and add 0.5 mL deionized water to obtain a 10 mg/mL EDC stock solution. Prepare EDC solution just before use.

1.4 Immediately, add 57 µL of 10 mg/mL EDC stock solution to the Qdot® solution (step 1.2).

1.5 Stir gently for 1–2 hours at room temperature for the conjugation.

1.6 Filter the conjugate solution through a 0.2 µm PES syringe filter to remove any large aggregates and transfer the solution to a clean centrifugal ultrafiltration unit (100 kDa cutoff).

1.7 Centrifuge at the recommended speed for the ultrafiltration unit for at least 5 buffer exchanges using 50 mM borate buffer, pH 8.3 to remove any excess unbound protein. Ensure

that the volume of concentration is >10-fold (e.g., 4 mL to <400 µL) each time.

1.8 After ultracentrifugation is complete, filter the solution through a 0.2 µm syringe filter or a 0.8/0.2 µm combination syringe filter to remove any aggregates. Store the Qdot® conjugate solution at 4°C. **Do not freeze** the nanocrystal conjugate.

Appendix 1: Troubleshooting Guide

The properties of Qdot® conjugates are different from fluorescent dyes and may require slight modifications to current protocols. We've included this section to help with some specific issues that may arise while using these materials.

No Signal

Optical Setup suitability

Make sure that you are using an appropriate filter set to detect the signals. See *Appendix 2* for a list of appropriate and optimal filters for the Qdot® conjugates. Contact Technical Support (probestech@invitrogen.com) for more details on particular filter set requirements.

Qdot® conjugate luminosity

Qdot® conjugates normally fluoresce brightly under a hand-held ultraviolet lamp (long wave, such as the type used to visualize ethidium bromide on agarose gels). The 705 and 800 nm quantum dot emission cannot be seen by eye, but is detected by many cameras and detectors. Though we have not seen pronounced loss of fluorescence of these materials under any storage conditions that we have investigated, we have not been able to examine all storage conditions. If the Qdot® conjugates do not appear to fluoresce under the long wave UV excitation, contact Technical Support (probestech@invitrogen.com) for assistance.

Appendix 2: Optimal Usable Filter Sets for Qdot® Conjugates

Table 3. Omega optical filter set for Qdot® conjugates.

Color	Optimal filter sets	Usable filter sets
525	XF301 Qdot®525 filter set (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP Emitter: 525WB20)	XF100-3, XF100-2, XF115-2, XF89-2
565	XF302 Qdot® 565 filter set (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP/ Emitter 565WB20)	XF104-2, XF105-2
585	XF303 Qdot® 585 filter set (Exciter: 1 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP/ Emitter: 585WB20)	XF101-2, XF137-2, XF152-2
605	XF304 Qdot® 605 filter set (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP/ Emitter: 605WB20)	XF108-2, XF102-2, XF103-2
655	XF305 Qdot® 655 filter set (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP/ Emitter: 655WB20)	XF102-2, XF40-2, XF42, XF45
705*	XF306 Qdot® 705 filter set (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP/ Emitter: 710AF40)	XF140-2, XF70, XF110-2, XF141-2, XF48-2
800 *	XF307 Qdot® 800 filter set (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP/ Emitter: 800WB80)	XF308 Qdot® 800 filter set for multiplexing (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP/ Emitter: 840WB80)
All colors†	XF300 Qdot® filter set (Exciter 1: 425DF45 or Exciter 2: 415WB100/ Dichroic: 475DCLP Emitters: 800WB80, 840WB80, 710AF40, 655WB20, 605WB20, 585WB20, 565WB20, and 525WB20)	XF129-2, XF130-2

*The 705 and 800 nm quantum dot emission cannot be seen by eye and must be detected with an IR-sensitive detector.
†For viewing multiple colors of Qdot® nanocrystals through microscope eyepieces.

Table 4. Semrock filter sets for Qdot® conjugates.

Color	Optimal filter sets	Usable filter sets
525	BrightLine® QD525-A Filter Sets: QD525-A-000 or QD525-A-000-ZERO (Exciter: FF01-435/40-25) (Dichroic: FF510-Di01-25 x 36) (Emitter: FF01-525/15-25)	GFP-3035B
565	--	FITC-3504B or YFP-2427A
585	--	TRITC-A
605	BrightLine® QD605-A Filter Sets: QD605-A-000 or QD605-A-000-ZERO (Exciter: FF01-435/40-25) (Dichroic: FF510-Di01-25 x 36) (Emitter: FF01-605/15-25)	TRITC-A
625	BrightLine® QD625-A Filter Sets: QD625-A-000 or QD625-A-000-ZERO (Exciter: FF01-435/40-25) (Dichroic: FF510-Di01-25 x 36) (Emitter: FF01-625/15-25)	Texas Red® (4040B)
655	BrightLine® QD655-A Filter Sets: QD655-A-000 or QD655-A-000-ZERO (Exciter: FF01-435/40-25) (Dichroic: FF510-Di01-25 x 36) (Emitter: FF01-655/15-25)	Texas Red® (4040B)
705*	--	Cy5-4040A or Cy5.5-A
800*	--	Cy7-A
LP multi†	QDLP-A Filter Set: QDLP-A-000 (Exciter: FF01-435/40-25) (Dichroic: FF510-Di01-25 x 36) (Emitter: FF01-500/LP-25)	CFW-LP01-CLINICAL

*The 705 and 800 nm quantum dot emission cannot be seen by eye and must be detected with an IR-sensitive detector.
†For viewing multiple colors of Qdot® nanocrystals through microscope eyepieces.

Table 5. Chroma Technology filter sets for Qdot® conjugates.

Color	Optimal filter sets	Usable filter sets
525	Qdot® 525 filter set (20 nm EM; 32006) (460SPUV/475DCXRU/D525/20nm) Qdot® 525 filter set (40 nm EM; 32010) (460SPUV/475DCXRU/D525/40nm)	FITC/RSGFP/Bodipy®/Fluo-3/DiO (41001), FITC/RSGFP Longpass (40012), BFP to GFP FRET (31032), BFP to GFP FRET wide excitation (31034), GFP wide blue excitation (31054)
565	Qdot® 565 filter set (20 nm EM; 32005) (460SPUV/475DCXRU/D565/20nm) Qdot® 565 filter set (40 nm EM; 32009) (460SPUV/475DCXRU/D565/40nm)	Eosin (41011), Cascade Yellow™ (31038), JP2(YGFP with EGFP-31040, Auramine (31015)
585	Qdot® 585 filter set (20 nm EM; 32004) (460SPUV/475DCXRU/D585/20nm) Qdot® 585 filter set (40 nm EM; 32008) (460SPUV/475DCXRU/D585/40nm)	R-PE (41003), Rhodamine LP (41032, FITC/PI (41016)
605	Qdot® 605 filter set (20 nm EM; 32003) (460SPUV/475DCXRU/D605/20nm) Qdot® 605 filter set (40 nm EM; 32007) (460SPUV/475DCXRU/D605/40nm)	Cy3 narrow excitation (41007a), Texas Red®/Cy3.5 (31004), TRITC (41002, 41002a, 41002b), Ethidium Bromide (41006)
655	Qdot® 655 filter set (20 nm EM; 32011) (460SPUV/475DCXRU/D655/20nm) Qdot® 655 filter set (40 nm EM; 32012) (460SPUV/475DCXRU/D655/40nm)	Texas Red® (41004), Propidium Iodide (41005), Fura Red™ (31012), Chlorophyll (31017), Allophycocyanin (31006)
705*	Qdot® 705 filter set (20 nm EM; 32014) (460SPUV/475DCXRU/D705/20nm) Qdot® 705 filter set (40 nm EM; 32015) (460SPUV/475DCXRU/D705/40nm)	Cy5 Longpass (41024), Cy5 (41008), Cy5 narrow excitation (41033), Cy5.5 (41023), Alexa Fluor® 680 (41042), Cy5.5 (red-shifted; 41022)
800*	Qdot® 800 filter set (30 nm EM; 32020) (460SPUV/475DCXRU/D800/30nm) Qdot® 800 filter set (50 nm EM; 32021) (460SPUV/475DCXRU/D800/50nm)	Cy7 (41009), Li-Cor for IRDye 800 (41037), Cy7 (SP106)
All colors†	Qdot® Multiple Emission Set (71014) (460SPUV, 475DCXRU, D525/20nm, D605/20nm, D565/20nm, D585/20nm)	UV (11000V2), Blue/Violet (11003V2), UV/Violet (11011V2)

*The 705 and 800 nm quantum dot emission cannot be seen by eye and must be detected with an IR-sensitive detector.
†For viewing multiple colors of Qdot® nanocrystals through microscope eyepieces.

Appendix 3: Extinction Coefficients

Table 6. Extinction coefficients of Qdot® conjugates at common excitation wavelengths.

Product	350 nm, in $cm^{-1}M^{-1}$	405 nm, in $cm^{-1}M^{-1}$	488 nm, in $cm^{-1}M^{-1}$	532 nm, in $cm^{-1}M^{-1}$
Qdot® 525 nanocrystals	710,000	360,000	130,000	Not applicable
Qdot® 565 nanocrystals	1,900,000	1,100,000	290,000	139,000
Qdot® 585 nanocrystals	3,500,000	2,200,000	530,000	305,000
Qdot® 605 nanocrystals	4,400,000	2,800,000	1,100,000	580,000
Qdot® 625 nanocrystals	14,700,000	9,900,000	2,700,000	870,000
Qdot® 655 nanocrystals	9,100,000	5,700,000	2,900,000	2,100,000
Qdot® 705 nanocrystals	12,900,000	8,300,000	3,000,000	2,100,000
Qdot® 800 nanocrystals	12,600,000	8,000,000	3,000,000	2,000,000

Appendix 4: Bibliography

There are a number of references that describe the size-dependent properties of the semiconductor nanocrystals. These range in complexity from fairly straightforward descriptions to fairly comprehensive mathematical and physical descriptions of the optical properties. In addition, we have included some representative references that describe the core-shell structures, and the improved chemical properties that are obtained through such structures. References 8–11 describe quantum dots and FRET:

1. Sci Am 285, 66 (2001); **2.** J Phys Chem B 100, 13226 (1996); **3.** J Am Chem Soc 115, 8706 (1993); **4.** Phys Rev B 53, 16338 (1996); **5.** J Phys Chem 100, 468 (1996); **6.** J Phys Chem B. 101, 9463 (1997); **7.** J Am Chem Soc 119, 7019 (1997); **8.** Nano Lett 1, 469 (2001); **9.** J. Am. Chem. Soc 126, 301 (2004); **10.** Nat Mater 2, 630 (2003); **11.** Nat Biotechnol 21, 1387 (2003).

A number of references describe the biological properties of some quantum dots used in experiments. These papers are selected to represent some of the different classes of applications, but this list is not exhaustive. These materials are all quite different from the Qdot® conjugates that are sold by Invitrogen, and the results are not necessarily representative of results attainable with these materials:

12. Science 281, 2013 (1998); **13.** Science 281, 2016 (1998); **14.** J Am Chem Soc 124, 4586 (2002); **15.** Proc Natl Acad Sci U S A. 99, 12617 (2002); **16.** Science 298, 1759 (2002); **17.** Nat Biotechnol 21, 41 (2003); **18.** Nat Biotechnol 21, 47 (2003).

Also of interest:

19. Lakowicz, J. *Principles of Fluorescence Spectroscopy*. Kluwer Academic Publishing, 1999; **20.** Conf Proc IEEE Eng Med Biol Soc 1, 1470 (2006); **21.** J Fluoresc 17, 193 (2007); **22.** Mol Cell Probes 21, 116 (2006); **23.** Kim J, Park, K and Hahn S K, Int J Biol Macromol, in press (2007); **24.** Stem Cells 25, 2128 (2007); **25.** Hotz, CZ., and Bruchez, M. Quantum Dots: Applications in Biology (Methods in Molecular Biology) 2007. **26.** J Am Chem Soc 128, 12800 (2006).

Product List **Current prices may be obtained from our website or from our Customer Service Department.**

Cat no.	Product Name	Unit Size
Q21341MP	Qdot® 525 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Q21391MP	Qdot® 545 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Q21331MP	Qdot® 565 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Q21311MP	Qdot® 585 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Q21301MP	Qdot® 605 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
A10200	Qdot® 625 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Q21321MP	Qdot® 655 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Q21361MP	Qdot® 705 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Q21371MP	Qdot® 800 ITK™ carboxyl quantum dots *8 µM solution*	250 µL
Related products		
S888	Streptavidin	5 mg

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Eugene, OR 97402
Phone: (541) 465-8300
Fax: (541) 335-0504

Customer Service:
6:00 am to 4:30 pm (Pacific Time)
Phone: (541) 335-0338
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probesorder@invitrogen.com

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