



Quantum Dot Barcode Structures and Uses Thereof

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Invention Description

Current research in genomics, proteomics and personalized medicine requires fast, precise and high-throughput target profiling. To meet this challenge, barcode technology for massively parallel and high-throughput bio-detection has attracted much attention. Furthermore, multifunctional carriers would find broad usage in *in vitro* diagnostics and in drug discovery laboratories. Organic dyes are typically used for fluorescent-labeling systems for target profiling. However, organic dyes are problematic for several reasons. They have a broad emission spectrum which severely limits the number of different color dye molecules which can be used simultaneously. They also lack photostability, ceasing to fluoresce under repeated excitation. The use of semiconducting quantum dots (QDs) offers numerous advantages over organic dyes including high quantum yields and a high resistance to photobleaching and chemical degradation.

Researchers at Arizona State University have recently developed a unique labeling system based on a microstructure containing multiple QD layers surrounding a core. Simultaneous excitation of the different QD layers defines a unique barcode for the microstructure. Therefore, this technology can provide a rapid multiplex detection method for a large number of different molecules each possessing its own unique barcode. The ability to quickly and efficiently characterize multiple biological target molecules will find immediate application in many sectors of the health science industry.

Potential Applications

This technology can be used for a variety of applications involving targeting of biological molecules and therapeutics.

- **Medical Diagnostics** – Trace biological molecules associated with medical problems, organ and disease specific arrays.
- **Proteomics** – Expression profiling
- **Genetic assays** – Gene expression, SNP profiling
- **Drug Delivery** – Scalable drug loading and controllable release.

Benefits and Advantages

- **Versatile** – Wide variety of applications
- **Fast** – Allows rapid targeting and identification of labeled molecules
- **High Throughput** – Allows simultaneous detection of multiple targets
- **Robust** – Resistant to photobleaching and chemical degradation
- **Water Soluble** – Competing technologies are based on QDs embedded in polymer beads which are poorly water soluble