Quantum dot display emerges as premium LCD

In an era of multimedia that has just dawned with the emergence of flat display, the display has evolved into a tool that can satisfy both the needs of viewers and content providers. There is also a mounting call for displays that can display various forms of information in an efficient manner instead of remaining to be a simple means of delivering audio-visual information, and the importance of a display as a means of presenting visual information is ever growing. The essence in the delivery of visual information is color. However, color is very hard to quantify and assess. Using it as a marketing tool would be even harder. Nevertheless, many manufacturers are trying to promote color gamut and image quality as major differentiators of flat displays for 2015.

White light emitting diode (LED)-based liquid crystal display (LCD) cannot match organic light emitting diode (OLED) in terms of wide color gamut. Also, enhancing the color filter or LCD pixels is not enough to make the product innovative. The niche is then filled by the quantum dot technology. Quantum dot not only offers enhanced performance with wide color gamut; the term ‘quantum’ also conveys an image of being mystique and high-tech.

Of course, quantum dot displays have some drawbacks. They use cadmium, which is a harmful material, and cadmium-free quantum dot yields relatively low brightness and efficiency, which is why full-film backlight unit (BLU) including the dual brightness enhancement film (DBEF) needs to be in the display for the time being. And for quantum dot film, which is one of the simplest options for now, there is a challenge of having to meet the performance needs not only for the material but also for the barrier film surrounding it, while speeding up the mass production at the same time. Even with a good-performing, well-made product, the film’s price, close to 100 dollars, is another huge obstacle to overcome. When all things go well, there still remains a big question whether it can appeal enough to the consumers only with the wide color gamut.

The trend in the display market after the release of the flat display has been to put focus on form factor at first, and then on image quality, and finally on both form factor and image quality. In 2015, the form factor and the image quality will be further upgraded that a fusion between curved and quantum dot display can be predicted. But still the big question remains: “Will quantum dot display ever be successful?”

Still, top-tier manufacturers are very enthusiastic about quantum dot display because they can find no other differentiating factor in LCD display. In addition, they want to take the advantage of OLED TVs earlier than others by developing and launching quantum dot (QD) TVs. What is interesting is that the manufacturers focusing on the OLED TV are investing in the QD TV as they are afraid of its growth potential and possible market encroachment in the future. That is, once a product setting a new trend is released, and some companies secure first mover advantage, it will be difficult for others to follow suit.
This report examined the properties of quantum dot and related application technologies that are expected to be widely used in 2015 and onward while providing an in-depth review of many potential areas of applications. Also covered are the methods of quantum dot manufacturing and synthesizing, and the current status and issues regarding the development of LCD BLU application technology. It also analyzed the current status of the quantum dot display suppliers and the supply chain management (SCM), and lastly, presented a forecast for the quantum dot display market.
**Table of Contents**

I. Overview
1. Report summary
2. Research methodology and data collection

II. Quantum dot properties and application technology
1. Quantum dot properties
2. Applications of quantum dot
3. Other applications of quantum dot
   - 3.1. Bio applications
   - 3.2. Solar cell
   - 3.3. Photodetector
   - 3.4. Lighting
   - 3.5. Transistor

III. Manufacturing methods of quantum dot
1. Quantum dot structure and composition
2. Physical properties of quantum dot
3. Quantum dot synthesis methods

IV. Application of quantum dot to LED
1. Technology overview
   - 1.1. LED technology
2. Quantum dot-applied LED
   - 2.1. Quantum dot LED application technologies
   - 2.2. Quantum dot LED application technologies
3. Challenges and outlook for quantum dot-applied LED

V. Quantum dot LED technology
1. Thin film-based LED technology
   - 1.1. OLED technology
   - 1.2. QLED technology (vs. OLED)
2. Properties and manufacturing methods of QLED
   - 2.1. Driving principle and device structure of QLED
   - 2.2. Manufacturing of QLED
3. QLED development status and outlook

VI. Application technology of quantum dot for LCD BLU
1. Technology overview
   - 1.1. LCD BLU technology
   - 1.2. Quantum dot applications in LCD BLU
2. Methods of quantum dot applications to BLU
   - 2.1. On-edge type quantum dot optical component (Tube)
   - 2.2. On-surface type quantum dot optical component (Film)
3. Development status and issues of quantum dot-applied LCD BLU

VII. Analysis on the quantum dot display SCM and current status of the related firms
1. Overview
2. Analysis on the SCM and current status of the related firms
   - 2.1. Samsung Electronics
   - 2.2. LG Electronics
   - 2.3. TV – Other companies
   - 2.4. Monitor, laptop, tablet, and smartphone

VIII. Quantum dot display market forecast
1. Overview
   - 1.1. Value
   - 1.2. Volume
2. Penetration
3. By application
   - 3.1. Value
   - 3.2. Volume
4. By type
   - 4.1. Value
   - 4.2. Volume
5. Quantum dot display market forecast by application
   - 5.1. Overall - TV
     - 5.1.1. By type – TV (Value)
     - 5.1.2. By type – TV (Volume)
     - 5.1.3. By size – TV (Value)
     - 5.1.4. By size – TV (Volume)
     - 5.1.5. Forecast for quantum dot sheet price in 55-inch TV LCD
     - 5.1.6. Forecast for quantum dot UHD TV display market share
   - 5.2. Overall - Monitor
     - 5.2.1. By type – Monitor (Value)
     - 5.2.2. By type – Monitor (Volume)
   - 5.3. Overall - Notebook
     - 5.3.1. By type – Notebook (Value)
     - 5.3.2. By type – Notebook (Volume)
   - 5.4. Overall - Tablet
     - 5.4.1. By type – Tablet (Value)
     - 5.4.2. By type – Tablet (Volume)
   - 5.5. Overall - Smartphone
     - 5.4.1. By type – Smartphone (Value)
     - 5.4.2. By type – Smartphone (Volume)