

INTRODUCTION

TOYO Corporation has been engineering and marketing a number of test solutions to serve the liquid crystal display (LCD) industry for some time now. The new LT1000 (see *figure 1*) represents the next generation in the evolution of this product line and the culmination of over twenty years of liquid crystal display measurement research and development work carried out by TOYO's engineering teams.

It is an ion impurity measurement system that provides a new and innovative method to characterize and measure ion impurity levels in liquid substances. And the patent-pending system is the first measurement solution of its kind to measure both organic and inorganic ions.

SUPERIOR PERFORMANCE AND ACCURACY

Conventional measurement solutions of this class are based on a chemical analysis approach and as such are designed to mainly measure impurity (not ions) and inorganic ion impurity.

The LT1000 can detect both organic and inorganic ion impurity with extremely high sensitivity in the ppt (parts per trillion) range. Additionally, the LT1000 is extremely sensitive when measuring ion concentrations. It detects even the most minute (in the parts per trillion (ppt) range) of ion concentrations in a substance. With more sensitivity and greater accuracy, there is less concern about getting a sub-optimal reading and more focus on achieving the optimal result.

The high resolution and accuracy provide an ability for lab engineers and technicians to detect impurities in test materials which is unmatched in the industry. Compared with other products in a similar class, the LT1000 can perform and complete a full test cycle in a second compared to conventional ion chromatography methods,



Figure 2: Broad Applications Across Many Industries

which can take upwards of one hour. This is on the order of more than 3,600 times faster allowing for a substantially larger number of tests to be performed over a given period of time. This accelerates lab analysis and helps shorten project development lead times.

ALTERNATIVE SOLUTIONS

There currently exist two methods to detect and characterize impurity or mobile ions in liquid materials but they have disadvantages when compared with TOYO's LT1000. High Performance Liquid Chromatography (HPLC) is one such



Figure 1: Front, Right Side View of the LT1000

technique. However HPLC is inherently not very sensitive with specifications in the parts per million (ppm) range. The LT1000 provides 1,000,000 times better resolution. The other method, nuclear magnetic resonance (NMR) spectroscopy, is slightly more sensitive than HPLC but NMR spectrometers are relatively expensive and can cost upwards of millions of dollars (US). Furthermore it requires a large facility to house the equipment.

BROAD APPLICATIONS

The results obtained by the LT1000 have broad applications in the display industry (see *figure 2*), ranging from liquid-material screenings to facilitating process optimization. It also has applications and supports use cases in other industries particularly those that have a requirement to detect any impurities in liquid based substances whether they are of an organic or inorganic type.

Since variations in ion impurity is an indicator of future defects or failures, the LT1000 can be used for quality assurance testing of materials and process control for display and smart window applications. Many industries could benefit from a LT1000 including (but not limited to) the display, smart window (aerospace, automotive), chemical, pharmaceutical, bio-tech, and environment testing industries.

MEASUREMENT RESULTS IN ONE SECOND

Refer to graphic in *figure 3* which shows the results obtained from the LT1000 on the same class of solvent from two

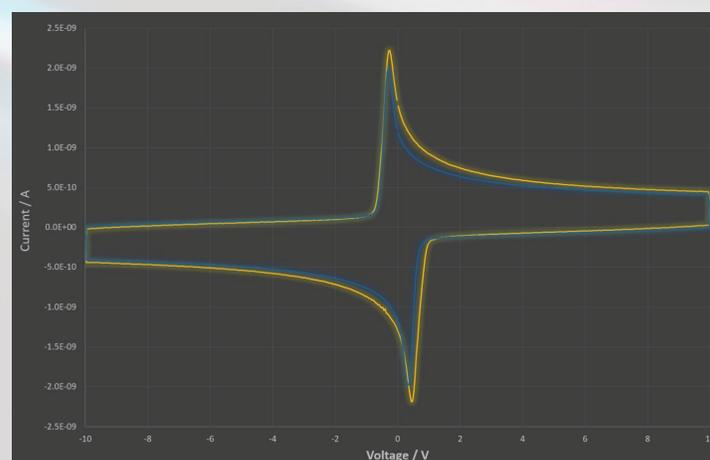


Figure 3: Test Results From Two Solvents

LT1000 Ion Impurity Measurement System



Figure 4: Using the LT1000 Ion Impurity Measurement System

- 1 Management PC
- 2 Management connection via WIFI or wired Ethernet
- 3 TOYO LT1000 Ion Impurity Measurement System
- 4 Probe/Test Connections between LT1000 and Shielding Box
- 5 Shielding Box with Temperature Controls
- 6 Test Cell

different suppliers. The testing shows that the sample from supplier B (represented by the blue line graph) contains less mobile ion content or has fewer impurities than the sample from supplier A (represented by the yellow line graph). And this measurement was performed in one second. Furthermore, the actual raw data is available for further data analysis.

Figure 4 shows a diagram of how the LT1000 integrates with other components to form the complete solution. For the most optimal results, the recommended configuration is to use the LT1000 with the supplied shielding box. The temperature controls on the shielding box itself is an option.

The management PC can be either a Windows or an Apple MAC. The LT1000 is managed either through a WLAN connection or a wired Ethernet connection. Internal workflow analysis demonstrates that in most cases, the LT1000 can be unboxed and ready for testing within a few hours.

SUMMARY

There is a new ion impurity measurement solution based on a patent-pending concept that is now available to the marketplace. It provides unparalleled performance, accuracy and flexibility. It is called the LT1000 Ion Impurity Measurement System and it is available only from TOYO Corporation.

LT1000 PHYSICAL SPECIFICATIONS*

Number of Test Channels	1
Front Panel Control	Power On/Off
Rear Panel Connectors	BNC (2), RJ45, Power, SMA (FOR WLAN antenna)
Communication Interfaces	WLAN and wired Ethernet
Dimension	3.4in (H) x 7.1in (W) x 14.2in (D); 8.5cm x 18cm x 36cm
Weight	11lbs; 5kg
Power	Internal switching power supply. 100-240VAC
Environmental	Operating: 50°F to 95°F; 10°C to 35°C (non-condensing)

LT1000 TEST SPECIFICATIONS*

Voltage output	±0.1 - ±10V (0.1V step)
Frequency	1mHz - 1kHz
Current measurement range	±10nA - ±100uA
Calculations	
Minimum ion charge	1pC~
Maximum resistance	~10TΩ
Minimum capacitance	1pF~
Measurement time	1sec/sweep @ 1Hz

SYSTEM REQUIREMENTS (for management s/w)*

Management PC	Apple MAC, Windows PC (supplied by user)
Processor	2 gigahertz (GHz) or faster; x86-bit or x64-bit processor
OS	Apple MAC: OS X 10.11 or later. Intel PC: Windows 7 SP1 or later (32/64 bit)
RAM	4 GB RAM (recommended)
Hard Disk	1 GB available disk space (recommended)
Graphics	1920 x 1080 (recommended)

* final specifications subject to change

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