Electrochromic Customer Information Displays Based on Viologen Modified Mesoporous Electrodes

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Electronic displays are becoming increasingly ubiquitous in society with the increasing demands being placed on information systems to output to the needs of consumers. The choice of electronic displays for particular applications is key to the success of the transmission of this information. Reflective displays, in general, provide a more attractive solution to light emitting displays for information display in high light intensity environments. In these environments, a weakness of light emitting displays is the "wash out" they experience from competition with the ambient light.

We will demonstrate a pre-commercial prototype of an electrochromic diffusely reflective customer information display that provides, for the first time, the superb optical qualities of paper based display media. It is our intention to provide these information displays as commercial products in 2003 for use in public transport systems such that the information can be read more easily by consumers and thus provide a better solution than those currently in place.

The electrochromic technology has been developed under the trade name NanoChromics™ for commercial applications at NTera Ltd. in collaboration with commercial partners. The devices are based on electrodes constructed from modified porous nanocrystalline films (Figure 1). Specifically, these nanostructured films are mesoporous films with pore sizes of up to 20 nm and crystallite sizes in the range of 5 to 20 nanometres. The nanostructured nature of these films provides surface areas far in excess of the geometric surface area. Roughness factors from 600 to 1000 are typical for these films which results in a significant amplification of the electrochromic effect with respect to a monolayer of viologen on a smooth surface.

A contrast ratio of 15:1 is attainable with these devices and Table 1 compares this with other reflective display technologies. The switching speeds of the devices are below one second for colouring and bleaching and for the targetted application, well within the performance criteria. The stability of the devices has been tested and over one million cycles at 70 ^{0}C have been achieved in addition to one million cycles at room temperature.

The performance characteristics of the displays will be discussed in detail and results achieved to date with regard to lifetime and stability issues will also be included.

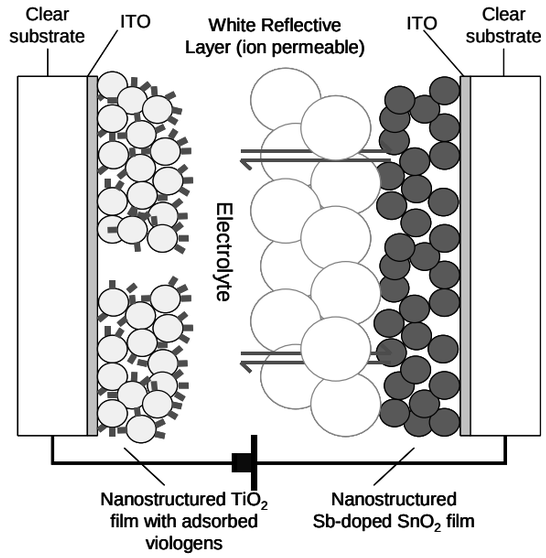

Figure 1: Cross sectional Diagram of the NanoChromics™ Reflective Display Device

Reflective Display Medium	Contrast Ratio
NanoChromics	15:1
E-Ink	11.5:1
STN LCD	4:1
Newspaper	7:1

Table 1: Contrast Ratio Comparison of Reflective Display Technologies.