

LCDs and WEEE: Solutions for an emerging problem

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Liquid crystals are special substances that exhibit an intermediate state of matter that exists between its crystal and liquid states of matter. The intermediate state of matter is termed a mesophase and possesses properties of a crystal, a liquid and some unique to the mesophase. The ability of a mesophase to modulate light (either transmits or block) in response to an external applied field is the basic premise of its modern-day success known as a liquid crystal display (LCD) found in calculators, mobile phones, laptop computers, satellite-navigation systems and the latest flat-screen large-area LCD televisions.

LCD technology is now the dominant global flat panel display technology with a market share in the region of 90% and sales revenues topping US\$100 billion. As LCDs continue to penetrate and saturate the large area flat panel display market there are major global environmental concerns both during their manufacture and now, perhaps more importantly, at their End of Life (EOL). Already, LCD containing waste electrical and electronic equipment (WEEE) has been identified as one of the fastest growing sources of waste in the EU, increasing by 16-28% every five years.

Herein, we present strategies for the isolation of liquid crystal from defunct LCDs found in WEEE. In particular the use of liquid and supercritical carbon dioxide as a benign solvent, as opposed to volatile organic solvents, is reported in detail. The isolated liquid crystal mixture is fractionated by preparative HPLC and the identity of individual components is ascertained by complementary spectroscopic techniques. The results of our research are beneficial to academic community, entrepreneurs and industrialists under the remit waste and recycling but also will stimulate discussion in the area of building technology partnerships.