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POLYMERS PAINT COLOUR JOURNAL

Inside: TiO_2 pigment
for quality inks

Inside: Reliable
solution for testing



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There is growing demand for ever-more attractive user interfaces and increasing use of touch screens on products, such as household appliances, as Marabu relates

Decorative printing on front panels

Touchpads and touch screens are very much part and parcel of our lives. In today's interconnected world, we communicate via smartphones, read novels on tablets and use devices with sophisticated touch technology on a daily basis. And expectations are rising with regards to both functionality and appearance.

HIGH-QUALITY PRINTING FOR DISPLAYS ON HOUSEHOLD APPLIANCES

Increasingly, manufacturers are incorporating input systems into front panels and panel inserts on household appliances, such as washing machines, dryers, dishwashers, ovens, coffee machines and microwaves. With growing frequency, the solution of choice is a capacitive touch interface. The decorative inks used on these devices must demonstrate a high level of resistance to ensure the input system operates correctly. Unlike their resistive counterparts, capacitive touchscreens do not require mechanical pressure. The screen comprises a single plastic panel, rather than multiple layers and is made of common materials, such as PMMA or PC. However, glass is becoming more popular as a substrate, as it offers many advantages – including a high level of resistance to scratches and soiling, as well as mechanical resistance.

PRODUCT AND COLOUR REQUIREMENTS

Household appliances make everyday tasks easier but also are increasingly appreciated for their appearance. The materials and ink employed on input systems must, therefore, be attractive but also capable of withstanding the trials of daily use. Inks must be easy to work with, be resistant to chemicals and high temperatures, have consistent batch-to-batch quality and form thin films even when in multiple layers. They must also undergo



various tests, such as low temperature, heat ageing, water vapour and cyclic corrosion testing. Moreover, they must fulfil aesthetic requirements. These include crisp edges, smooth ink flow, white lightness (L value), colour co-ordinates (laboratory value) and high opacity. Marabu has developed specially formulated shades of black with extremely high electrical resistance (such as the non-conductive Mara Switch MSW opaque black 181) specifically for front panels to ensure the reliable operation of input systems. Transparent varnishes, also known as diffuser or filter inks, that are backlit by LEDs, are also available.

NEW SPECIAL-PURPOSE INKS FOR DECORATIVE PRINTING ON PANELS

Marabu's solvent-based and UV-curable inks are ideal for complex decorative printing tasks for input systems. Screen printing offers a wide range of colours, special effects and functional layers for high-quality capacitive input systems. To achieve extremely high resistance and fulfil specific requirement profiles, the back of transparent plastic and glass substrates (front panels) can be screen-printed using one- or, if needed, two-component ink systems. In this context, the Mara Switch MSW product line has

a number of advantages. It includes new special-purpose inks that, unlike their predecessors, are not classified in reproduction toxicity category two.

This means fewer workplace health and safety constraints for the appliance manufacturer. Moreover, the decorative inks can be blended to create custom colours. The Mara Switch MSW line is ideal for second-surface printing of the entire front panel and also for diffuser and symbol printing. The new, specially developed Mara Switch MSW 181 achieves excellent coverage on pre-printed inks (white, silver, black, colour, etc).

Marabu's highly-resistant, solvent-based two-component ink systems, Mara Glass MGL and Tampa Glass TPGL, are perfect for printing front and decorative panels in glass. If UV inks are required, the tried-and-tested Ultra Glass UVGO and Ultra Glass UVGL ink systems, as well as the special-purpose inks from the Ultra Glass UVG3C line, are ideal.

UV TECHNOLOGY – THE SOLUTION FOR INTRICATE DECORATIVE PRINTING

Use of UV-curable inks is steadily increasing across all segments and input systems are no exception. The inks are solvent-free and this has tangible advantages. They do not clog the mesh

screen – making it easier to print intricate lettering and symbols. UV ink systems have very short drying times, resulting in higher production speeds and, therefore, lower costs. Moreover, UV-curable inks do entail residual solvents in multi-layered structures. This avoids potential ink adhesion issues caused by chemical interactions with other components, such as adhesive systems. Further advantages include compliance with thresholds for chemical concentrations in the workplace (MAK thresholds in Germany) and the environmental benefit of eliminating solvent emissions.

Structures combining UV-curable and solvent-based ink systems have

also proven successful. In order to take advantage of the aforementioned benefits, letters and symbols on plastic panels are printed with UV inks from the Ultra Mold UVPC line. The subsequent blocking layer is created, for example, with the Mara Switch MSW line's non-conductive opaque black.

However, for plastic panels there is a clear trend toward using layers of inks comprising exclusively UV inks – as is already normal practice for glass panels. Against this background, Marabu is currently developing a UV-only solution for plastic panels. All defined requirements have been successfully fulfilled within

the scope of initial tests performed with leading-name project partners. It proved possible to create a UV-only multi-layer structure for letters and symbols, including the final blocking layer. Marabu is looking forward to offering customers this new solution for plastic panels in the near future.

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Conductive ink markets 2017-2027

This report, *Conductive Ink Markets 2017-2027: Forecasts, Technologies, Players*, provides a comprehensive and authoritative view of the conductive inks and paste market, giving detailed 10-year market forecasts segmented by application and material type. The market forecasts are given in tonnage and value at the ink level.

This report is based upon years of research. In the past five years alone, IDTechEx analysts have interviewed more than 100 industry players, visited numerous users/suppliers across the world, attended more than 20 relevant conferences/exhibitions globally and worked with many industry players to help them with their strategy towards this market. Prior to this, the analysts played an active role in commercialising conductive pastes, particularly in the photovoltaic industry.

The complete global picture

This report includes critical reviews of all the competing conductive inks and paste technologies including firing-types pastes, PTFs, laser-cut or photo-patterned pastes, nanoparticles, stretchable inks, in mould inks, copper, copper/silver alloys, nanocarbon and more. Here, the latest performance levels/progress, technology challenges, key suppliers, existing and emerging target market and forecasts where appropriate are outlined.

This report also provides a detailed assessment of more than 25 application sectors. Here, it analysed the market needs/requirements, discuss the business dynamics, market leadership and technology change trends, competing solutions, latest product/prototype launches, key players and market forecasts in tonnes and value.

The following existing and emerging sectors are covered: Photovoltaics; Touch screen edge electrodes; Automotive electronics; In mould electronics; e-Textiles and wearable electronics; 3D printed electronics; ITO replacement; PCB; RFID; Printed piezoresistive, capacitive and bio sensors; OLED and large-area LED lighting and many more.

In this report are covered more than 130 companies. For most, insights are provided based on primary intelligence obtained through interviews, visits, conference exhibition interactions, personal communications and so on. For more than 50 there are full interview-based company profiles, including a detailed SWOT analyst and IDTechEx Index.

Changing business landscape

The conductive ink/paste industry is in the midst of undergoing major change. For example, the volume photovoltaic market will do well in the first half of 2017 thanks to the looming end of feed-in-tariff in China. This will spell good news even for those companies who had seen their market share decline well below 20%. However, the industry remains concerned that it may reach peak silver consumption within the next three years in this highly cost competitive market that sees only incremental innovation.

Similarly, the touch screen edge electrode market continues to be shaped by the perennial trend to narrow the bezel. This trend has already led to the introduction of new photo-patterned and laser-cut pastes to achieve L/S of 20/20. Such ink innovations have so far enabled printing to remain competitive but the industry remained concerned here too that sputtering will become even more of

a threat in the coming years when the L/S shrinks further.

New growth opportunities emerge

In fact, such competitive pressures in core markets have seen suppliers adopt a strategy of developing as broad a product portfolio as possible to seed and develop numerous nascent emerging sectors.

Indeed, multiple new materials and formulations are being developed to satisfy new market requirements in nascent, niche sectors. These sectors are often characterised by uncertainty, poorly-defined figures-of-merit and not yet fully fledged value networks.

The target markets are numerous and include e-textile and wearable electronics, EMI shielding, in-mould electronics for automotive and home appliance applications, ITO replacement, digitisers, printed sensors and so on.

Nobody wants to be left behind

These markets, however, represent the future growth opportunities. Indeed, IDTechEx Research forecasts that these emerging sectors will grow to nearly become a US\$400M market opportunity by 2027.

The ship is sailing now and nobody wants to be left behind. This is why companies are now allocating resources, iterating formulations and development of commercial ecosystems. This is why the conductive ink business has come alive again.

To learn more about this industry refer to the IDTechEx report on *Conductive Inks 2017 - 2027*.

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