Wednesday, May 13

1:30 p.m. W-8 Roll-to-Roll Deposition for OLED Lighting Devices

C. May, S. Mogck, and J. Amelung, Fraunhofer IPMS, Dresden, Germany

OLED technology has successfully penetrated the display market within the last years. To enable OLED technology for further markets like signage and general lighting, cost reduction is a major issue. The use of ITO coated glass substrates as used for passive matrix displays is therefore not an option for lighting application. Low cost metal foil as substrate for the deposition of organic light-emitting diodes will allow a major cost reducing step. Furthermore, there is a need to replace sheet to sheet fabrication technologies by roll-to-roll-processing. Using the existing equipment for vacuum evaporation of small molecule materials on glass substrates OLED on commercial aluminum sheets were fabricated. Relative thick doped transport layers allow it to get stable devices on rough substrates too. Results for highly efficient top emitting OLEDs on rough metal substrates will be presented. Within the Center of Organic Materials and Electronic Devices Dresden, (COMEDD) of Fraunhofer IPMS a roll-to-roll line for research and development in OLED lighting is currently under installation. The paper discusses the line concept and technological demands for OLED roll-to-roll fabrication as substrate roughness, substrate patterning, small molecule organic layer deposition and encapsulation. First results will be presented.

Wednesday, May 13

2:10 p.m. W-9 Opportunities and Challenges in Flexible Electronics

D.J. McClure, 3M Corporate Research, St. Paul, MN

Invited 40 min. Talk

The promise and /or attractiveness of flexible electronics seem obvious: building electronic devices in roll-to-roll formats would reduce device costs dramatically. Some applications actually require flexibility. There are likely more applications that do not require flexibility per se, but rather value the reduced weight, reduced thickness, and, perhaps most importantly, the improved mechanical robustness that flexibility provides. We will review the many technical challenges involved in flexible electronics: materials performance, durability, and cost, substrate cleanliness and distortion issues, device patterning and yield problems, and the lack of standardized production tool sets. Many opportunities for materials and process advancements remain. A key barrier to rapid expansion of this technology area is the lack of an identifiable market that justifies the capital investment required without incurring a disproportionate market risk.

Wednesday, May 13

2:50 p.m. W-10 Pentacene Deposition for Vacuum Web Coated Organic Transistors

G.A.W. Abbas and H.E. Assender, University of Oxford, Oxford, United Kingdom

We have investigated routes to the development of roll-to-roll vacuum processed organic TFTs. Use of a vacuum-deposited organic layer as the semiconductor in a transistor device could allow the integration of this deposition with other vacuum-deposited layers with a view to cheap, flexible TFT arrays. One candidate material for the semiconductor is evaporated pentacene, and much preliminary work has been reported by many groups in constructing devices on rigid substrates under high vacuum static deposition conditions. In an attempt to investigate a roll-to-roll deposition (with a lower vacuum than previous studies) and to implement a vacuum compatible surface functionlisation method, we investigated the structure of pentacene films thermally grown at low vacuum with various gas ambience conditions ($3x10^{-3}$ mbar of N_2 and Ar). The semiconductor films exhibited a thickness-driven structural transformation which controls the conductivity of the layer. X-ray diffraction and micro-focal Raman spectroscopy results will be presented to show how the vacuum conditions control the quality of the deposited semiconductor layer. These results imply that the optimal charge transport efficiency in pentacene semiconductors can be obtained through the appropriate growth environment.

Wednesday, May 13

3:30 p.m. W-11 Sputtering Synthesis of Antimicrobial Materials and Associated Process Optimization Approaches to Remain Competitive in Global Markets

D. Field, NUCRYST Pharmaceuticals, Fort Saskatchewan, Canada

Invited 40 min. Talk

While silver has long been known to possess antimicrobial properties, the most commonly used forms (silver nitrate and silver sulfadiazine) have historically demonstrated serious shortcomings in terms of efficacy and delivery. In the 1990s, magnetron sputtering was used to synthesize unique nanocrystalline antimicrobial silver films, which addressed these shortcomings. The improved performance of these films resulted in rapid market penetration of various sputter-coated, silver-based products for treatment of serious burn wounds and other indications. Following on this success, sputtered silver-based powders were also developed for use as antimicrobials and anti-inflammatories. This presentation will describe the development and efficacious properties of these sputtered, silver-based antimicrobial films and will discuss the challenges in synthesizing such materials on a wide variety of substrate types. Attention will be given to the various approaches in dealing with such challenges so as to remain competitive in a global market. More specifically, the reduction of manufacturing costs through various theoretical and experimental approaches will be reviewed. Examples of specific challenges, such as limiting heat flux at the substrate, will also be presented.

Wednesday, May 13

4:10 p.m. W-12 In-Register In-Vacuum Pattern Printing; From Wish to Reality

N. Copeland and L. Harland, General Vacuum Equipment, Heywood, United Kingdom (Presented by A. Jack, General Vacuum Equipment, Heywood, United Kingdom)

The use of flexo printed oil within a metallizer is a well known method that enables complex patterns to be metallized directly in a single pass. In this new development this in-vacuum pattern printing process has been developed further, so that the positioning of the pattern can be controlled to remain in-register with precision to a printed or embossed mark on the polymer substrate. This means that a pre-printed or embossed substrate can now have selective metallization applied to compliment existing designs. This is an important development as it assists the production of advanced packaging designs such as high security devices that depend on both the clear and un-metallized areas be in-register to highlight the different security features. In this paper we will highlight the benefits of this technology including examples of material that has been metallized in-register.

Wednesday, May 13

4:30 p.m. W-13 Impact of Metallizing Process Parameters on Metal Deposition, Optimum Film Properties and Converting Performance

E. Mount, EMMOUNT Technologies, LLC, Canandaigua, NY

The metallization process is straightforward and conceptually well understood, but at the same time it is quite complex and at times troublesome. While the overall process parameters for each machine are essentially the same, we find that various chambers will show an increased sensitivity to some parameters as opposed to another set of parameters. The controlling factors for each machine will impact the quality, metallized properties and the converting performance of the final product. As evidence of this, we find metallization chambers which can readily produce a product that the metallizer down the street just cannot reproduce and vice versa. The focus of this talk will be to review the principle metallizing process parameters which are common for all metallizers, to compare those that are specific to unsupported and supported machines and explore how these process parameters can impact the metallized film properties and defects. In some cases, comments relating to the film design and its impact on the metallizer process and defect generation will also be made.

Wednesday, May 13

4:50 p.m. W-14 Multi-Layer, Low Emissivity Materials

A. Yializis and S. Yializis, Sigma Technologies International, LLC, Tucson, AZ

Aluminum foil has long been the dominant material used for applications requiring low emissivity surfaces for heat reflection and energy management. Metallized aluminum films, though initially exhibiting emissivity values equal to their bulk foil counterparts, are far more susceptible to performance degradation as a result of oxidation and corrosion of the reflective aluminum layer in the presence of heat and moisture. This is due in part, but primarily, to the amount of sacrificial aluminum available to be consumed by the oxidation reaction. Investigated are novel, multi-layer, low emissivity materials incorporating one or more vacuum deposited layers designed to protect vacuum deposited aluminum layers from oxidation and corrosion, as wells as to enhance the emissive properties of the multi-layer structure by providing a planarized surface on which to deposit the reflective aluminum layer. Various substrates ranging in material composition and breathability are investigated as potential replacements for perforated, and non-perforated aluminum foil laminates for heat reflection and low emissivity applications.