Electronic Organic and Inorganic Hybrid Nanomaterials—Synthesis, Device Physics and their Applications

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Electronic Organic and Inorganic Hybrid Nanomaterials—Synthesis, Device Physics and their Applications

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CONTENTS

*Invited Paper

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MEMORY AND PHOTONIC SWITCHING DEVICES

PHOTOVOLTAICS

*Invited Paper

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SENSOR AND BIOLOGICAL APPLICATIONS

NEW HYBRID MATERIAL SYNTHESIS AND CHARACTERIZATIONS

*Invited Paper

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PREFACE

The possibility of combining properties of organic and inorganic components in a unique hybrid composite material creates many potential applications. The combination at the nanosize level of inorganic and organic, or even bioactive components, in a single material has made accessible an immense new area of materials science that has extraordinary implications in the development of multifunctional materials. The promising applications are expected in many fields, including display, thin film transistors, electronic memory and switching devices, photonics, sensors and biological applications. Symposium NN, "Electronic Organic and Inorganic Hybrid Nanomaterials—Synthesis, Device Physics, and their Applications", was held April 25–29 at the 2011 MRS Spring Meeting in San Francisco, California. In this Proceedings volume, we have accepted 26 excellent papers on the following topics: a) display; b) thin film transistors; c) memory and photonic switching devices; d) photovoltaics; e) sensor and biological applications; and f) new hybrid material synthesis and characterizations.

Among all of the papers, we would like to highlight the following papers: The first paper is about technology being developed at Hewlett-Packard (HP) (MRSS11-1359-NN01-01): Conventional displays typically use a combination of side-by-side color elements to generate additive color (e.g., RGB or RGBW color filters), and this approach has been shown by others with black and white reflective electro-optic layers. Since reflective images rely solely on ambient light, the image will be bright and colorful only if the incident light is reflected efficiently. Side-by-side color approaches devote portions of each pixel to only certain colors, so they inherently absorb the majority of the incident light, and thus are inefficient ($<$50% efficiency), resulting in limited color gamut volume. Addressing this challenge, HP presented a new approach of generating bright, high-quality reflective color images from the perspective of printing by layering subtractive colorants (CMYK) to allow every available color at every addressable pixel location. Layered colorants in electronic media can be enabled by stacking electro-optic layers that are modulated between colored and transparent optical states. In order to provide a transparent state with fast switching using circuits fabricated on a plastic substrate by a flexible roll-to-roll (R2R) manufacturing platform, HP has developed novel electro-kinetic front-plane architecture with electrically addressable inks. This technology has great potential for a variety of commercial applications such as electronic skins, signage, and personal color e-readers. In a similar field, Professor Chen, et al., at Zhejiang University (MRSS11-1359-NN01-05) have developed novel elastic, optical transparent, spherical gelatin-based microcapsules with high thermal stability for long-lasting electrophoretic display by using complex coacervation in the presence of the specific anionic surfactants. Optical materials in the optical circuit board are required to overcome soldering process. In particular, the material should not have absorption and shape changes after heating at around 250 ˚C. Nissan Chemicals has developed a novel organic-inorganic hybrid material having a high thermal stability and low

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absorption at telecom wavelength, which is perfect for such application (MRSS11-1359-NN05-05).

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