



Abstract Collection

APOSTILLE workshop 02
Printed, flexible and
nano electronics

APOSTILLE, project no. 256615



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Agenda

Thursday, May 09 th 2013, Novi Sad, Serbia		
19:30	Welcome dinner, Restaurant "Aqua Doria" (http://www.carda.rs/)	
Friday, May 10 th 2013, Novi Sad, Serbia, Hotel CENTAR (http://www.hotel-centar.rs/)		
9:30 – 10:00	Registration of the participants	
Part I – Presentation of the main results (APOSTILLE team and EU partners)		
10:00 – 10:15	Promotional movie of the APOSTILLE project	Prof. Dr Goran Stojanović, FTS, UNS, RS Prof. Dr Staniša Dautović, FTS, UNS, RS
10:15 – 10:30	Design of memristor-based circuits for printed electronics	Speaker: Prof. Dr Luigi Fortuna, DIEES, IT Authors: A. Buscarino, L. Fortuna, M. Frasca, L. V. Gambuzza
10:30 – 10:45	Cascading Wafer-Scale Integrated Graphene Complementary Inverters in Ambient Air	Speaker: Prof. Dr Roman Sordan, L-NESS, IT Authors: E. Guerriero, L. Polloni, L. G. Rizzi, M. Bianchi, A. Behnam, E. Carrion, E. Pop, R. Sordan
10:45 – 11:00	Low temperature processing of lead zirconate titanate thick films by inkjet printing	Speaker: Prof. Dr Danjela Kuščer, JSI, SI Authors: D. Kuščer, O. Noshchenko, M. Pajic, T. Bakarič, B. Malič
11:00 – 11:15	Layer-by-Layer thin film deposition technique and prospecting applications	Speaker: Dr Jovan Matović, ISAS, AT
11:15 – 11:30	Preparation, characterisation and processing of carbon black/SU8	Speaker: Dr Marijana Mionić, EPFL, SZ Authors: M. Mionić, A. Ganz, H. Hofmann
11:30 – 12:00	Coffee break	
Part II – Presentations of other partners in the field		
12:00 – 12:15	PE advances in Smart Textiles	Speaker: Eduardo Loscos, Cetemmsa, ES
12:15 – 12:30	EDA tools for Printed Electronics	Speaker: Prof. Dr Jordi Carrabina, UAB, ES Authors: J. Carrabina, L. Teres, E. Ramon, D. Marin
12:30 – 12:45	Processing Thick-Film Conductive Inks with Photonic Curing	Speaker: Stan Farnsworth, Novacentrix, USA Authors: V. Akhavan, K. Schroder, D. Pope, I. Rawson, A. Edd, S. Farnsworth
12:45 – 13:00	Screen printed RFID Antennas, Humidity Sensors and Piezoelectric Devices Implemented on Papers, Cardboards and Foils	Speaker: Prof. Dr Tadeja Muck, UoL, SLO Authors: M. Đokić, U. Kavčič, M. Mraović, A. Pleteršek, D. Randelović, G. Kaltsas, T. Muck
13:00 – 13:15	Colloidal Nanocrystal-Block Copolymer Hybrids for Efficient Large Area Device Fabrication	Speaker: Dr Mahmut Kuş, SU, TR Authors: M. Kuş, S. Buyukcelebi, A. Erdoğan, K. Kara, M. Ersoz
13:15 – 13:30	Novel Diblock Copolymers for Large Area Nanopatterns	Speaker: Nurhan Mehmet Varal, SU, TR Authors: F. Ozel, A. Erdoğan, S. Buyukcelebi, N. M. Varal, M. Kuş, M. Ersoz
13:30 – 15:00	Lunch break	
Part III – Presentations of the APOSTILLE team and Serbian partners		
15:00 – 15:15	Eddy current position/presence sensor based on ink-jet printed inductor	Speaker: Dr. Nikola Jeranče, FTS, UNS, RS Authors: N. Jeranče, N. Bednar, G. Stojanović
15:15 – 15:30	Characterization of an Ink-Jet Printing Technology for Microwave Circuit Applications	Speaker: Dr. Veljko Napijalo, FTS, UNS, RS Authors: V. Napijalo, D. Vasiljević, A. Marić, G. Stojanović
15:30 – 15:45	Application of Dielectric Barrier Discharge Non-thermal Plasma in Nanosynthesis	Speaker: Nikola Bednar, FTS, UNS, RS Authors: N. Bednar, J. Matović
15:45 – 16:00	Sequence Generators and Minimization Algorithms for Digital Memristive Circuits	Speaker: Predrag Teodorović, FTS, UNS, RS Authors: P. Teodorović, S. Dautović
16:00 – 16:15	Printed Sensors – State of the Art and the Latest Trends	Speaker: Danjela Randelović, IMTSC, UB, RS Authors: D. Randelović, T. Muck, G. Kaltsas
16:15 – 16:30	Towards the mechanism of stabilization of TPD thin films with UV light	Speaker: Aleksandar Tomović, IP-UB, RS Authors: A. Tomović, N. Markešević, V. P. Jovanović, R. Zikic, M. Scarpellini, E. Lucenti, P. Milani, V. I. Srdanov
16:30 – 16:45	Capacitive Angular Position/Speed Sensors – Incremental Encoders Based on Flexible Printed Electronics	Speaker: Damir Krklješ, FTS, UNS, RS Authors: D. Krklješ, G. Stojanović
16:45 – 17:15	Coffee break	
Part IV – Steering Committee meeting and concluding remarks		
17:15 – 17:45	The forth Steering Committee meeting	
17:45 – 17:50	End of the workshop day - Conclusions	
20:00	Dinner, Restaurant "Žal za mladost" (http://www.zalzamladost.net)	
Saturday, May 11 th 2013, Novi Sad, Serbia		
10:00 – 17:00	Short Excursion, Novo Hopovo – Perkov salaš – Vinari Kovačević, Sremski Karlovci	

Towards the mechanism of stabilization of TPD thin films with UV light

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Triphenyldiamine (TPD) or N,N'-bis(3-methylphenyl)-N,N'-bis(phenyl)benzidine is a well known hole-transporting material often used in electroluminescent devices. In bulk material glass transition temperature $T_{PDg} \sim 60^\circ\text{C}$ [1] is rather low and for sufficiently thin films (thickness $d \leq 30$ nm) deposited on a fused-silica substrate, dewetting occurs even at room temperature [2]. Morphological changes, which are often related to low T_g , lead to degradation of device performance in which thin films are incorporated. That is why it is interesting to find a way to stabilize thin films. Following a brief report [3] on increased stability of UV irradiated TPD films, we focused on elucidating the underlying mechanism, since an explanation of chemical changes on molecular level has not yet been given. Thin amorphous TPD films were produced in physical vapor deposition (PVD) process on a fused silica or glass substrates. Immediately after evaporation one half of each sample was exposed to UV light under ambient conditions in order to compare effects of irradiation on a single film. Illuminated and non-illuminated areas of films are characterized using UV-visible spectroscopy and atomic force microscopy (AFM). Decrease in absorption bands intensity was observed after irradiation, indicating a chemical change in the sample. AFM study clearly shows that dewetting process at room temperature is stopped for irradiated samples thinner than 30nm. Illuminated samples remained stable even after few weeks of storage under ambient conditions and after 24h exposure to temperatures $T > T_{PDg}$. From proton nuclear magnetic resonance and mass spectrometry measurements, we find that photo-excited TPD reacts with oxygen from air, which leads to oxidation and hydroxylation of small amount of TPD molecules. We conclude that increased thermal stability of irradiated films is due to hydrogen bonding among TPD molecules and molecules formed in hydroxylation process.

References:

- [1] K. Naito and A. Miura, J. Phys. Chem. 97, 6240 (1993).
- [2] E. Suljovrujić, M. Mičić, S. Demic and V. I. Srdanov, Appl. Phys. Lett. 88, 121902 (2006).
- [3] E.M. Han, J. J. Yun, G. C. Oh, S. M. Park, N. K. Park, Y. S. Yoon and M. Fujihira, Opt. Mater. 21, 243 (2002).