NEWSLETTER of the SID-MID EUROPE CHAPTER

SID – ME

SOCIETY FOR INFORMATION DISPLAY

Nr. 13,
September 2002

SID-ME Chapter Spring 2002 meeting on Polysilicon technology and applications for AM-LCDs and AM-OLEDs organised by CNR – IFN Istituto di Fotonica e Nanotecnologie, Rome-Italy , March 21-22, 2002

The SID-ME Chapter Spring 2002 meeting on Polysilicon technology and applications for AM-LCDs and AM-OLEDs was organised by CNR – IFN Istituto di Fotonica e Nanotecnologie. More than 60 people attended the meeting in Roma. The meeting was opened by G.Fortunato of the Istituto di Fotonica e Nanotecnologie He remarked that the polysilicon technology is the key technology for both AMLCDs and OLEDs. J.Kimmel and D.Theis welcomed the attendants on behalf of the SID-ME Chapter.

Session 1, March 21 afternoon

A. Silzars (President of the SID) gave talk on Rows and Columns -- Technologies for Addressing Displays of Ever-Increasing Complexity. He indicated that LCDs will be the dominant display technology for the coming 10 years with desktop monitors as the main product. He warned the audience that high resolution is a

cost driver and not to increase the resolution when not required by the application. He concluded that manufacturing costs become the major driving force for development. This requires simpler (non-semiconductor) production processes. In the development of new materials a slow evolution is expected.

P. Migliorato (Univ. of Cambridge) talked about the trap-assisted generation-recombination processes and transient effects in poly-silicon TFTs. The generation -recombination processes are dependent on the nature and properties of the traps and the influence of the external electric field. The dynamic behaviour of poly-silicon TFTs is largely determined by these generation-recombination effects.

R. Ishihara (DIMES – Univ. of Delft) presented a paper on single crystal-Si TFTs fabricated with advanced excimer-laser crystallisation process. The main purpose is to increase the grain size and to decrease the channel size. By doing this the amount of grain boundaries in the channel decreases and the effective mobility is increased. The c-Si TFT is then positioned inside a location controlled grain made by a micro Czochralski technique. These TFTs show a high field effect mobility of 450 cm^2 /Vs.

T. Mohammed-Brahim (Univ. of Rennes) compared the electrical parameters and reliability of polysilicon TFTs made by using different laser crystallization techniques. Very large excimer laser equipment did give TFTs which were not stable under electrical stress. This is due to oxygen when laser recrystallisation is carried out in air. When this is prevented high performance, good uniformity and high stability under electrical stress is achieved. Laser annealing by second harmonic pulsed Nd:YVO4 scanning laser gives elongated grains in the scanning direction. This technique is characterized by low throughput. The improved CW Nd:YVO_4 in combination with a 2-D scanning mirror gives a low cost crystallization technique.

Session 2, March 21 afternoon.

S. Brotherton (Philips Redhill UK) explained the mechanism of Excimer Laser Annealing which has issues like throughput and uniformity. These are conflicting requirements. The near-melt-trough regime gives large grain materials and high mobility but has a small process window. The Sequential Lateral Solidification technique uses fine beamlets to ensure that the material is fully melted in this region. There is lateral growth from adjacent regions. The SLS method promises to address the ELA issues.

T. Noguchi (Univ. of Paris Sud) discussed the basic factors for high performance poly-silicon TFTs. Small grains give high uniformity, but performance e.g. leakage current is poor and large grains give the opposite trend. He compared the SPC (solid phase crystallisation carried out in a furnace) with the Excimer Laser Annealing technique. The latter was found to be a promising technique. It was concluded that crystallinity in that channel as well as the interfacial trap states should be improved.

A.Pecora (CNR-IFN, Rome) introduced a novel device fabrication technique where source/drain contacts of polysilicon TFTs are made by deposition of highly doped layers. The so-called trailing edge and leading edge methods were compared. The results are comparable with those of the best ion implantation technologies.

A. Rubino (ENEA- CR Portici) presented polycrystalline silicon technologies as used in ENEA institute. They are developed in connection with Active Matrix OLED. Among these enabling tools are a CAD tool assembly for complex poly-Si circuits, an adjustable beam homogenizer and laser irradiation equipment for a-Si films on plastic substrates.

Conference dinner.

The conference dinner is the place to exchange ideas and to continue discussions. The selected location in Rome offered a superb view over the Forum Romanum. In such an inspiring cultural setting during a nice dinner it was easy to discuss, renew contacts and to make new friends.

Session 3

N. Fruehauf (Univ. of Stuttgart) talked about the low temperature poly-Si technology at the Laboratory for Display Technology in Stuttgart. He gave an overview of the various methods to deposit LT-poly Si. Thereafter he addressed in particular the direct deposition of Si with the Electron Cyclotron Resonance PECVD technique as is available at the Stuttgart university. This is followed by single area excimer laser crystallisation. The preferred top-gate TFT structure process was also described e.g. the ion implantation technique and the dry RIE process.

C. Dimitriadis (Univ. of Thessaloniki) explained the origin of noise sources in polysilicon TFTs. There are two noise sources : 1) located in grain boundaries and 2) located in the poly-Si/SiO_2 interface. The noise amplitude scales inversily with the size of grain boundaries and grains that act as a noise source. TFT's with low in-grain defect densities will show noise sources located on grain interfaces. The study of low frequency noise is a technique to reveal structural properties of traps.

A. Valletta (CNR-IFN, Rome) presented TFT architectures for drain field relief. The high field near the drain junction is mainly due to the abruptness of the doping profile in self-aligned structures. This causes the kink effect which is the increase in saturation current due to generation electron-hole pairs induced by the high electric field near the drain junction. Drain field engineering provided several options such as Lightly Doped Drain poly-Si TFT's.

SID-MEC General Meeting

During the SID-ME meeting the activities of the Chapter were reported. There were reports on the committee meetings, the financial situation of the Chapter and the 2 SID-ME scholarships that were recently awarded to enable students to visit the SID in Boston.
Also the election of the officers of the SID-ME chapter for the coming period took place.
The new Chapter committee is now composed as follows:
Norbert Frühauf (Chair), Jaap Bruinink (Vice-Chair), Andre van Calster (secretary), Frank Rochow (treasurer).

Session 4 March 22.

H.J. Kahlert (Microlas) focussed on the equipment for systems on glass in general for application in microelectronics. He explained the properties of equipment for high resolution location controlled excimer laser based annealing of Si films for AMLCDs. This equipment uses an excimer laser source in combination with an UV (308 nm) long life optical system for the near-melt method (Sequential Lateral Solidification).
J. Stoimenos (Univ. Thessaloniki) presented a paper on in situ TEM observations of Ni induced lateral crystallization of a-Si, subsequently annealed by laser. He explained that metal induced lateral crystallisation gives larger crystalline grains than the conventional Solid Phase Crystallisation technique. The method is faster and operates at lower temperature. However the off-current is higher due to the Ni that is found inside the grains.
M. Schubert (IPE, Stuttgart) reviewed the properties of single-, micro-, or nano-crystals for use in poly-Si TFTs. He explained that charged grain boundaries are a key for understanding. The nano-crystalline Si can be deposited with hot-wire CVD, which was considered as a promising technique.

Session 5 March 22.

This session was an application session.
G. Collé (TECDIS, Chatillon) started with an overlook of display technologies that are candidates for the new 3rd generation portable equipment. In particular he discussed the developments in the bistable LCD effects such as surface bistable nematic, cholesterics, ferroelectrics, flexo-electric nematics and flexo-electric with surface grating. Main emphasis was on the Bistable Twisted Nematic Bistable LCD as patented by CNRS in 1995. This effect shows a good achromaticy and might be an alternative technology for 3G terminals.
J. Kimmel (Nokia) reviewed the applicability aspects of polysilicon based displays in mobile communications devices. He described the route from 2.5G towards 3G applications and underlined that this development is evolutionary. Both the AMLCD and AMOED applicability are considered for in- and out-door use. The Nokia UI style cellular phone development process has several phases and includes a large colour screen, enhanced navigation system. Due to the increased functionality the phone approaches a pocket PC type. Power consumption in the stand-by mode is still a key issue.
D. Pribat (Thales) presented the application of Polysilicon p-i-n diodes to low cost reflect array antennas. These antennas might be used as radar antennas for car cruise control, but at present they are used in missile seekers. The reflect array antennas are based on integrated PIN diodes on Si . The manufacturing of these PIN diodes was discussed. A low on-resistance and low (stray) capacitance are required.
S. Cinà (Cambridge Display Technology) gave an overview of the CDT company and talked about recent developments in Organic Light Emitting Diodes. After explaining the device structure and depostion technologies like inkjet printing he discussed the specific properties and issues e.g. life time and efficacy of the RGB colours. For the blue colour more stable polymers are developed so that at present a lifetime of 3500hrs @ 100Cd/m^2 is obtained. Degradation is still the main issue.
M. Pizzi (Centro Ricerche FIAT) presented the on glass Micro Optical Electromechanical Shutter for display applications. This technology combines very low power (intrinsic memory) with miniaturisation capability. The pixel addressing is by rows and columns. The cantilever design is good for a transmittance of 80% (high brightness). The cantilever rolls on the surface with a speed of 1m/second at 100 Volts which is good for a switching speed of 1.5 msec. The contrast of the first prototype was 20:1.
The last speaker of this conference was *X. Fohrer (Clare)*. He talked about OLED display system performance considerations. After an extensive overview of available column and row drivers he focussed on display interfacing. Finally the OLED power consumption was analysed. The main issue is here the large (200 mA) peak current due precharging. This high current might cause metal migration.

Closing remarks

All European expertise on poly-Si was present and the discussions were at high level. A full view of the presentations can be found on http://web.iess.rm.cnr.it/SID or http://150.146.11.94/SID.

Jaap Bruinink.

A perfect blend of Poly-Silicon High Tech and Eternal Rome ...

This was the unanimous rating of all attendees who had the pleasure to experience the perfectly organized SID MID-Europe Chapter Spring '02 Meeting in Rome. On behalf of the SID MID-Europe Chapter Committee it is my great pleasure to thank our Italian friends from the Istituto di Fotonica e Nanotechnologie for a job exceptionally well done.
Guglielmo Fortunato and Luigi Mariucci and their team not only helped us in putting together the program and attracting high profile experts in the field of polycrystalline silicon to the meeting, but they also perfectly managed back office duties and assembly of the electronic collection of all conference presentations.

The conference took place in a beautifully painted historic meeting room at the Consiglio Nazionale delle Richerche (CNR), literally under the eyes of scientific giants such as Galileo Galilei and Marconi. As a "first" in the history of SID MID-Europe we had the honour to welcome the acting SID president, Aris Silzars, at our meeting, whose interesting opening lecture highlighted the future challenges for the advancement of display technology. The following presentations indicated the world class European expertise in the field of polycrystalline silicon technology and initiated enthusiastic discussions among the attending experts.

For those who attended the well-organized and scientifically high profile conference, the Spring '02 SID MID-Europe meeting was an exceptionally valuable experience, including an unforgettable night on the roof terrace of a fantastic Italian restaurant overlooking the historic Forum Romanum.

Last but not least we gratefully acknowledge the draft of the conference report compiled by Jaap Bruinink.

Norbert Fruehauf
SID MID-Europe Chapter Chairman

Scholarships.

The first SID-Mid Europe Chapter Scholarships were awarded as travel grants to SID 2002 in Boston. Mr. Filip Bruneel and Mr. Wim DeMoerloose, both students at University of Ghent in Belgium, presented posters titled "Reflective color PDLC displays using color filters" and "Reducing greyvalue non-uniformities in microdisplays". We wish all the best for these promising students in their further efforts. Scholarships for 2003 will be announced in the next Newsletter.

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Coming Events:

Eurodisplay 2002, October 1-4, 2002 Nice - France

SID-ME Spring meeting, March 6-7, 2003, Neuchatel, Switserland. Place: Institute for Microtechnology. Topic: Display Components

For more details and call for papers see the SID website.

SID-ME Chapter committee.
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SID payment.

The SID annual membership fee amounts US$ 75. Please note that the membership is now a rolling membership, which means that it runs 12 months from the month in which the payment was made. For more information see the SID web-site www.sid.org.
We encourage our members to pay directly to SID-HQ in the USA, but if they want to pay to the ME-Chapter directly the annual fee should be EUR 90 **with all bank fees covered by the member !**
In case of direct payment to the SID-ME Chapter the payment in EURO should be done to

Account no.:	206 020 1104
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Bank code:	BLZ 100 500 00
Account name:	Frank Rochow, SID-ME

Please indicated your name on the remittance papers.

The Newsletter.

If you want to place an article in the Newsletter, which is interesting for the European display society, please send it to: J.Bruinink, fax: +31 40 274 4335,
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