AN INTERNATIONAL WORKSHOP, JUNE 13TH TO 14TH 2016
CEST/WIENER NEUSTADT

BIOELECTROCHEMISTRY AND MORE
Registration is requested until June, 9th 2016 at office@cest.at

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AN INTERNATIONAL WORKSHOP, JUNE 13TH TO 14TH 2016
CEST/WIENER NEUSTADT
The AIT Austrian Institute of Technology and CEST invite you to the lecture series:

BIOELECTROCHEMISTRY AND MORE

Date: Monday, 13th June 2016 – Tuesday, 14th June 2016
Location: Lecture Hall TFZ, 1st floor, Unit A

Monday, June 13th

08:30 Mounting of Posters
09:00 PhD Student Seminar with Poster Session
11:30 Lunch
12:30 Welcome
   Christoph Kleiber (CEST)
   Wolfgang Knoll (AIT Austrian Institute of Technology GmbH)
   Michael Klosterer (Stadt Wiener Neustadt)
12:40 Organic Bio-Electronic Sensors for Ultra-Sensitive Detection
   Luísa Torsi
13:20 Dielectric and Semiconductor Surface Interfacial Interactions for
   Biomimetic Integrated Nanosystems Based on Solid-State Nanopores:
   Nanofluidic-Enabled "Iontronic" Transduction of Biological, Chemical
   and Physical Stimuli
   Omar Azzaroni
14:00 Interfacing with the Brain Using Organic Electronics
   Georges Mailfaras
14:40 Coffee and Posters
15:30 Analysis of Molecules and Macromolecules at Electrolyte/Solid Interfaces – Interface Chemistry, Self-Organization and Interfacial Forces
   Guido Grundmeier
16:10 Detection of Unlabeled Biomolecules Using Simplified Reflective Interferometry
   Lewis Rothberg
16:50 Electrochemical Biosensor Systems for POC Diagnostics
   Martin Weber
17:30 A Decaheme Cytochrome as a Molecular Electron Conduit in
   Dye-Sensitized Photoanodes
   Lars J. C. Jeuken
18:10 End of Lecture Day 1

Tuesday, June 14th

09:00 Biosensing for Molecular Diagnostics: Current Trends and Perspectives
   Maria Minunni
09:40 Coupling and monitoring chemical fluxes of microstructured enzyme layers
   Gunther Wittstock
10:20 Ultra-Sensitive System to Detect Minute Ionic Gradients within
   Glioma Cells
   Paulo Rocha
11:00 Coffee
11:30 Semiautofit Artificial Photosynthesis, How to Wire Photosystem 1 and 2 to
   Electrodes
   Wolfgang Schuhmann
12:10 Selective and Reversible Ion-Detecting Sensor Elements in Aqueous Environment Based on Organic Electronic Devices
   Emil J.W. List-Kratochvil
12:50 Lunch and Posters
13:30 Mechanical and optical sensing of biological systems using thin film electronics
   Ioannis Kymissis
14:10 Bioelectronic Nose and Tongue: Integration of Human Receptors and Nano Devices
   Tai Hyun Park
14:50 Electronic Plants
   Magnus Berggren
15:30 Closing Remarks
16:10 End (Lab Tour optional)
PhD Workshop „bioelectrochemistry and more.....” 13. Juni 2016

8.30 – Anbringen der Poster

9.00 Beginn – ca. 3 min Kurzpräsentation, im Anschluss an die Präsentationen Diskussion an den Postern

9.00: Stefan Ziebermayr
9.05: Beate Stallinger
9.10: Jie Sun
9.15: Gabriela Schimo
9.20: Christina Bliem
9.25: Georg Hölzl
9.30: Andreas Sikora
9.35: Markus Nadlinger
9.40: Lisa Mayerhuber
9.45: Esteban Piccinini
9.50: Johannes Bintinger
9.55: Sebastián Alberti
10.00: Jan Hrbac
10.05: Cezarina Mardare
10.10: Patrik Aspermair
10.15: Andreas Geiss
10.20: Florian Glöcklhofer
10.25: Paul Kautny
10.30: Thomas Kader

ab 10.35: Diskussion an den Postern

11.30: Pause
Introduction
The aim of this work was the synthesis and characterization of a new class of bipolar host materials based on triarylamino donors connected by two triazole linkers and an aromatic center, resulting in a donor-acceptor-donor structure (Figure 1). Effects of different substitution pattern as well as increased planarization of the triarylamino were investigated.

Synthesis
Starting from dihalogenated species 1a-e different substituted dialkynes 3a-e were obtained by Pd-catalyzed cross coupling reactions with TMS-acetylene and subsequent base induced removal of the TMS protecting group. Lithiation of brominated donor units 4a-b and quenching with PINBOP leads to corresponding boronic acid esters 5a-b. Further conversion with sodium azide gives TPA/Pc2-azide (6a-b).

1,4-substituted 1,2,3-triazoles 7a-f were synthesized via Cu-catalyzed azide-alkyne-cycloaddition.[1] Synthesis of 1,5-substituted triazole 7g was accomplished by metal-free base-catalyzed azide-alkyne-cycloaddition.[2]

Characterization and Device Fabrication
Delayed low temperature photoluminescence measurements revealed high triplet energies (Eₜ) between 2.69 eV and 2.70 eV for 1,4-substituted triazoles with TPA donor subunit. Surprisingly, Eₜ are independent of the aromatic center and its substitution pattern, which suggests that conjugation only takes place between the triarylamino and the triazole. In contrast different substitution of the triazole within 15TPA26Pyr (7g) leads to a shift towards lower energies. 14PCz26Pyr (7f) containing a PCz subunit is clearly blue shifted due to the decreased donor strength of this subunit, resulting in an Eₜ of 2.92 eV. Furthermore, UV/Vis absorption and emission spectra show similar structure property relationships. Results from further characterization are given in table 1.

Initial experiments with solution processed green PhOLED devices were performed with 14TPA26Pyr (7b) and 14TPA13Phen (7d) as host materials. While a 14TPA26Pyr based device reached maximum current efficiency (CE) of 26.9 cd/A, maximum power efficiency (PE) of 15.7 lm/W and maximum external quantum efficiency (EQE) of 8.0% a device with 14TPA13Phen as host material reached a CE of 35.0 cd/A, PE of 24.13 lm/W and EQE of 10.3% (figure 3).

Conclusion and Outlook
A reliable, straightforward synthetic protocol towards a new class of 1,2,3-triazole based host materials for PhOLEDs was established. Results from the characterization suggest that conjugation between the donor subunit and the aromatic center is inhibited and only takes place between the donor and the triazole. Modifications of device architecture and improvement of the solubility of click host materials are part of our ongoing research.

Table 1. Results from photophysical and thermal characterization. *Calculated from the onset of the oxidation peak from CV-measurements. *Calculated from the HOMO levels and the optical bandgap. *Determined from the absorption onset. *Estimated from the highest vibrionic transition in solid solutions at 77K. *Determined from DSC/TGA analysis.

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<td>14TPA26Pyr (7a)</td>
<td>-5.36</td>
<td>-2.06</td>
<td>3.30</td>
<td>2.69</td>
<td>121.7</td>
<td>285.5</td>
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<tr>
<td>14TPA35Pyr (7b)</td>
<td>-5.34</td>
<td>-2.04</td>
<td>3.30</td>
<td>2.70</td>
<td>124.7</td>
<td>334.9</td>
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<tr>
<td>14TPA13Phen (7c)</td>
<td>-5.38</td>
<td>-2.05</td>
<td>3.33</td>
<td>2.70</td>
<td>121.4</td>
<td>342.2</td>
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<td>14PCz26Pyr (7f)</td>
<td>-5.73</td>
<td>-2.19</td>
<td>3.54</td>
<td>2.92</td>
<td>186.9</td>
<td>341.6</td>
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<td>15TPA26Pyr (7g)</td>
<td>-5.37</td>
<td>-2.07</td>
<td>3.30</td>
<td>2.59</td>
<td>111.6</td>
<td>355.0</td>
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References

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Figure 1. 1,2,3-Triazole based bipolar host materials

Figure 2. Delayed low temperature photoluminescence spectra (left) and UV/Vis absorption (dashed lines) and emission (full lines) spectra (right) of compounds 7a, 7d, 7f and 7g.

Figure 3. Current density-voltage-luminance (left, full symbols: current density, hollow symbols: luminance) and current efficiency-luminance-power efficiency (right, full symbols: current efficiency, hollow symbols: power efficiency) curves for 14TPA35Pyr (7b) and 14TPA13Phen (7d) based PhOLED devices with the device architecture of ITO/PEDOT(35nm)/Click-Host:Ir(mppy)$_2$(acac)(30nm)/TPBi(50nm)/LiF(10nm)/Al(100nm).

Scheme 1. Synthetic approach towards target molecules 7a-g.