

# 4<sup>th</sup> International Conference on **Electrochemistry**

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## Electrochemistry of bipolar s-tetrazine derivatives

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1,2,4,5-tetrazine, especially 3,6-disubstituted derivatives are very well known materials, in particular, in the field of the energetic chemistry. However, s-tetrazine ring has a number of other interesting properties. It is electroactive, with a very high electron affinity, furthermore it is highly colored. It is the smallest fluorophore, which makes s-tetrazine derivatives very promising molecules for active layers in optoelectronics devices such as organic light emitted diodes (OLED), electrofluorochromic and electrochromic windows. The functionalization of the ring with electron-donating group leads to obtain the donor-acceptor-donor (D-A-D) type of structure, which can serve as both: electron as well as hole transporting materials. Electrochemistry is a suitable method for characterization of new electroactive organic materials for optoelectronic and electronic applications. It provides lots of information about redox properties, stability, the conversion and storage of energy, etc. It also allows to determine the electron affinity and ionization energy of investigated compounds, parameters which are correlated with energies of HOMO and LUMO level, which need to be determined if materials are investigated towards optoelectronic applications. In this work we present the electrochemical and spectroelectrochemical characterization of bipolar s-tetrazine derivatives. The characterizations of studied compounds were performed using: electrochemical techniques including cyclic voltammetry (CV) and differential pulse voltammetry (DPV) measurements; spectroelectrochemical investigations such as UV-Vis, EPR, Raman and fluorescence spectroelectrochemistry. The electrochemical characterization indicated that a few of studied s-tetrazine derivatives undergo electrochemical polymerization (oligomerization) which is rarely observed in this group of compounds. Hence, monomers as well as electrochemically obtained polymers were studied. Their redox processes have been investigated by *in situ* UV-Vis and EPR spectroscopy. A huge effect of chemical structure on the electrochemical properties was observed. Introduction of oxygen atom as a linker between donor and acceptor part of molecules resulted in obtained thin polymer layer with unique properties.

### Recent Publications

1. Sandra Pluczyk, Pawel Zassowski, Laurent Galmiche, Pierre Audebert and Mieczyslaw Lapkowski (2016) Tuning properties of 3,6-disubstituted-s-tetrazine by changing the chemical nature of substituents. *Electrochimica Acta* 212:856-863.
2. Pawel Zassowski, Sylwia Golba, Lukasz Skorka, Grazyna Szafraniec Gorol, Marek Matussek, Dawid Zych, Witold Danikiewicz, Stanislaw Krompiec, Mieczyslaw Lapkowski, Aneta Slodek and Wojciech Domagala (2017) Spectroelectrochemistry of alternating ambipolar copolymers of 4,4- and 2,2-bipyridine isomers and quaterthiophene. *Electrochimica Acta* 231:437-452.
3. Przemyslaw Ledwon, Pawel Zassowski, Tomasz Jarosz, Mieczyslaw Lapkowski, Pawel Wagner, Vladyslav Cherpak and Pavlo Stakhira (2016) A novel donor-acceptor carbazole and benzothiadiazole material for deep red and infrared emitting applications. *J. Mater. Chem. C* 4:2219-2227.
4. Christina Enengl, Sandra Enengl, Sandra Pluczyk, Marek Havlicek, Mieczyslaw Lapkowski, Helmut Neugebauer and Eitan Ehrenfreund (2016) Doping-induced absorption bands in P3HT: Polarons and Bipolarons. *ChemPhysChem* 17:3830.
5. Renata Rybakiewicz, Eric D Glowacki, Lukasz Skorka, Sandra Pluczyk, Pawel Zassowski, Dogukan Hazar Apaydin, Mieczyslaw Lapkowski, Malgorzata Zagorska and Adam Pron (2017) Low and high molecular mass dithienopyrrole-naphthalene bisimide donor-acceptor compounds: synthesis, electrochemical and spectroelectrochemical behavior. *Chem. Eur. J.* 23:2839-2851.

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**Biography**

M Lapkowski is a Full Professor of Silesian University of Technology and Director of Department of Physical Chemistry of Polymers, Faculty of Chemistry, Polish Academy of Science. His fields of research activity are the synthesis of electronic conducting polymers, the physicochemical characterization of polymers, oligomers and composite materials, synthesis and characterization of new organic materials for optoelectronics and photovoltaic. He was an Assistant Professor in l'Université de Nantes, (France), and Invited Professor in l'Ecole Normale Supérieur de Cachan, (France), University of Sao Paolo, Brazil, University of Woolongong, Australia and Tohoku University, Japan. He is a Member of International Society of Electrochemistry since 2005.

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