

Sensing properties of electrochemically deposited polyaniline film doped with poly (3, 4-ethylenedioxythiophene)

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Among different electrochromic materials conducting polymers and their derivatives are attractive due to their ease of processability, good stability, rapid response time and perfect optical properties. Conducting polymers are widely used in the fabrication of many devices such as transistors, sensors, biosensors and fuel cells. Furthermore, these polymers possess unique electrochromic and electrochemical properties and are perfect candidates for designing smart windows, optical and electrochromic sensors. In this work a film of electrochromic conducting polymers polyaniline and poly (3, 4-ethylenedioxythiophene) (PANI-PEDOT) was electrodeposited on a transparent indium tin oxide (ITO) modified glass from a water-based solution, characterized and applied for pH sensing. The optical properties and response time of the developed PANI-PEDOT film-based sensor was compared with PANI film. In addition, the PANI-PEDOT, PANI and PEDOT films thickness, surface activity, charge density and diffusion coefficient were calculated and compared. The doping of PANI by PEDOT improved conductivity of the synthesized film and shortened the response time of developed sensor. Absorbance at maximum of the three peaks (448, 602 and 895 nm) of PANI-PEDOT film depended linearly on the pH value of the solution in the range from 3.8 to 7.4. The developed sensor can be used for pH determination in physiologically important pH interval, especially when acidification of physiological fluids occurs during the course of the disease. In addition, synthesized PANI-PEDOT film can be used in the design of CO₂ gas sensors sensitive to the pH change of solution after the dissolution of gas.

Recent Publications

1. Gicevicius M, Celiesiute R, Kucinski J, Ramanaviciene A, Bagdziunas G and Ramanavicius A (2018) Analytical evaluation of optical pH-sensitivity of polyaniline layer electrochemically deposited on ITO electrode. *Journal of The Electrochemical Society* 165(14):H903-H907.
2. Naveen M H, Gurudatt N G and Shim Y B (2017) Applications of conducting polymer composites to electrochemical sensors: a review. *Applied Materials Today* 9:419-433.
3. Deshmukh M A, Gicevicius M, Ramanaviciene A, Shirsat M D, Viter R and Ramanavicius A (2017) Hybrid electrochemical/ electrochromic Cu(II) ion sensor prototype based on PANI/ITO-electrode. *Sensors and Actuators B Chemical* 248:527-535.
4. Das T K and Prusty S (2012) Review on conducting polymers and their applications. *Polymer Plastics Technology Engineering* 51(14):1487-1500.

Biography

Almira Ramanaviciene has completed her PhD in Biomedicine in the Institute of Immunology at Vilnius University, Lithuania in 2002. During 16 years of her research experience she gathered deep knowledge in biosensors development using electrochemical, optical and acoustic signal transducers. She has comprehensive experience in the synthesis of conducting polymers; metallic and polymeric nanoparticles and surface modification with different nanostructures and biomolecules. She is the co-author of more than 160 peer-reviewed research papers and reviews.

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