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Asymmetrical polysulfides chemistry: Synthesis and cyclic voltammetry study on coated and bare gold electrodes

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Asymmetrical polysulfides were prepared and characterized using NMR and elemental analysis as well as X-ray crystallography. The di- and tri-polysulfides electrochemical reduction potentials were studied using cyclic voltammetry on bare and coated gold electrodes. The electrochemical reduction process is irreversible and seems to be diffusion-controlled in the absence of coated gold electrode surface adsorption phenomena. However, we found that on a bare gold electrode surface, a self-assembled monolayer of TrSAuads and RSAuads for disulfides and TrSSAuads or RSSAuads for trisulfides originates after S-S bond breakage observed by simply dipping the gold electrode in a solution of sulfides. This study indicates that the electron transfer mechanism of the studied compounds causes cleavage of the S-S σ bond on the bare gold electrode and cleavage of the Tr-S σ bond on the coated gold electrode. The electrochemical electron transfer process for both systems strongly depends on the structure and the type of substituents that are either electron donors or acceptors. The experimental approach allows estimating the values of Eored and the intrinsic barrier for the formation of the radical anions as well as comparing the results with those obtained previously on a glassy carbon surface. The constant-current STM images recorded for a gold-substrate are shown in .

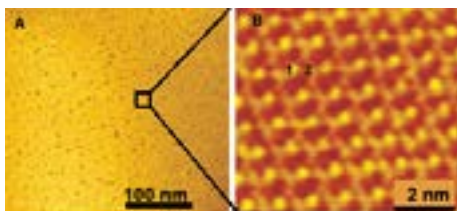


Figure 1. Constant-current images for a gold-substrate, which has been immersed for 24 h into 100 μ M solution of TrSSCH₂CH₂Ph in ethanol: (A) large scale and (B) small scale at 298 K (U = 500 mV; I = 228 pA).

Recent Publications

1. Abu-Yousef, I. A.; Rys A.; and Harpp D.N. Journal of Sulfur Chemistry, 27(1), 15-24, 2006.
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4. Flink, S.; van Veggel, F. C. J. M.; Reinhoudt, D. N. Adv. Mater. 2000, 12, 1315.
5. Weisser, M.; Nelles, G.; Wohlfart, P.; Wenz, G.; Mittler-Neher, S. J. Phys. Chem. 1996, 100, 17893

Biography

Imad Abu-Yousef earned a PhD in Organic Chemistry from McGill University, Canada. He pursued a post-doctoral fellowship in polymer chemistry at McGill University. Prior to joining AUS, he served on the faculty of several universities. His main research interests include sulfur chemistry, organic electrochemistry, polymer chemistry, photocatalysis, medicinal chemistry and synthesis of new organic polychalcogenides.