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Synthesis and cyclic voltammetry study of asymmetrical triphenylmethane di- and trisulfides on coated and bare gold electrodes

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A new series of asymmetrical trityl di- (TrSSR) and trisulfides (TrSSSR) were prepared and characterized using ^{1}H-, ^{13}C-NMR and elemental analysis as well as by X-ray crystallography. The materials were tested for their electrochemical reduction processes using cyclic voltammetry on both bare and coated gold electrodes. On a coated gold electrode surface adsorption phenomena are absent; the electrochemical reduction process is irreversible and found to be diffusion controlled. In contrast, on a bare gold electrode surface, a self-assembled monolayer of $TrSAu_{ads}$ and $RSAu_{ads}$ for disulfides and $TrSSAu_{ads}$ or $RSSAu_{ads}$ for trisulfides originates after S-S bond breakage observed by simply dipping the gold electrode in a solution of sulfides. The data presented herein indicate that the electrochemical electron transfer process for both systems highly depends on the structure and the type of substituents where the electron transfer process causes the decomposition of the S-S bond on the bare gold electrode and the Tr-S σ bond on the coated gold electrode. The experimental approach allows estimating the values of Eored and the intrinsic barrier for the formation of the radical anions. The results were then compared with those obtained previously on a glassy carbon surface. The structures of the tested compounds are illustrated in the figure below.

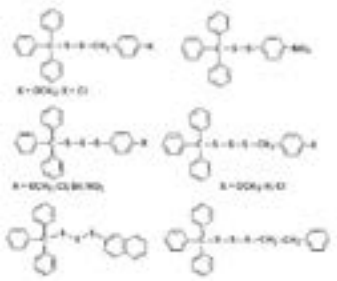

Figure 1: Structural formula of the studied sulfur based compounds.

Recent Publications:

1. Abu Yousef I A, Rys A and Harpp D N (2006) Preparation and reactivity of unsymmetrical di and trisulfides. Journal of Sulfur Chemistry, 27(1):15-24.
2. Abu Yousef I A, Al Rawashdeh N and Kanan S Electrochemical studies of new unsymmetrical trityl di- and trisulfides. Research & Reviews in Electrochemistry.1(2):81.
3. Al Rawashdeh N, Abu Yousef I A and Kanan S J (2008) Cyclic voltammetry study of asymmetrical trityl di- and trisulfides on coated and bare gold electrodes. Phys. Chem. C. 112(17):7062.
4. Flink S van Veggel F C J M and Reinhoudt D N (2000) Sensor functionalities in self- assembled monolayers. Adv. Mater. 12(18):1315-1328.
5. Weisser M et al. (1996) Kinetics of cyclodextrins at gold surfaces. S. J. Phys. Chem. 100:17893.

Biography

Imad A Abu Yousef earned a PhD in Organic Chemistry from McGill University, Canada. He pursued a Post-doctoral Fellowship in Polymer Chemistry at the same university. Prior to joining as Professor in American University of Sharjah, UAE he served as 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.

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