Adsorption of O1-[6-(methylselanyl)hexanoyl]glycerol (SeOG) on the gold surface was investigated by cyclic voltammetry, phase-sensitive AC voltammetry, electrochemical impedance spectroscopy and piezoelectric microgravimetry. SeOG adsorption results in a stable and compact surface layer with the coverage degree close to unity for an adsorption time of 30 to 80 min and 4.6 mM SeOG acetonitrile solution. Such a layer displays minute defects (pinholes) with the radius of ca. 1–3 μm, separated by 6–50 μm intervals (depending on the adsorption time). The adsorbed compound undergoes anodic desorption in the gold oxide region and also undergoes a cathodic process leading to the removal of the surface layer. Both these processes are similar to those demonstrated by short-chain alkanethiols and have been interpreted as an indication for the conversion of the selena to selenol function as a result of a dissociative adsorption process. Apparently, the main component of the surface layer is O1-(6-selanylhexanoyl)glycerol that results by the cleavage of the C6–Se bond in SeOG. The two free hydroxy groups in SeOG allow to use it as a bridge for binding other compounds to the gold surface. This possibility was illustrated by building up surface layers of a carotenoid derivative (O1-(8′-apo-β-apo-caroten-8′-oyl)-O2-[6-(methylselanyl)hexanoyl]glycerol, II) or carotenoid- and phosphocholine-derivatized SeOG (O1-(8′-apo-β-caroten-8′-oyl)-O2-[6-(methylselanyl)hexanoyl]-O5-[2-(trimethylammonio)ethoxy]phosphoryl]glycerol, III). The compound III generates a less densely packed layer due to the constraints induced by the phosphocholine substituent. Each of these compounds undergoes anodic reactions that are typical of carotenoids in the adsorbed state. However, the polar and hydrophilic phosphocholine residue in III shifts the anodic peak to a less positive potential. SeOG allows therefore to tune the molecular environment of a surface attached compound by means of a suitable co-substituent.

Keywords: Carotenoids; Glycerol; Selenides; Self-assembled monolayers; Electrochemistry.