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Investigation of an Alkanethiol Modified Au Electrode as Sensor for the Antioxidant Activity of Plant Compounds

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Abstract : Thiol molecules are known to easily form self-assembled monolayers (SAM) on Au surfaces. Depending on the thiol's structure, surface modifications via SAM can be used for electrode sensor development. In the presented work, 1-decanethiol coated polycrystalline Au electrodes were applied to indirectly assess the radical scavenging potential of plant compounds and extracts. Different plant compounds with reported antioxidant properties as well as an extract from the plant Gynostemma pentaphyllum were tested for their effectiveness to prevent SAM degradation on the sensor electrodes via photolytically generated radicals in aqueous media. The SAM degradation was monitored over time by differential pulse voltammetry (DPV) measurements. The results were compared to established antioxidant assays. The obtained data showed an exposure time and concentration dependent degradation process of the SAM at the electrode's surfaces. The tested substances differed in their capacity to prevent SAM degradation. Calculated radical scavenging activities of the tested plant compounds were different for different assays. The presented method poses a simple system for radical scavenging evaluation and, considering the importance of the test system in antioxidant activity evaluation, might be taken as a bridging tool between in-vivo and in-vitro antioxidant assay in order to obtain more biologically relevant results in antioxidant research.

Keywords : alkanethiol SAM, plant antioxidant, polycrystalline Au, radical scavenger
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