Electroanalysis of chiral polyphenols catechin and epicatechin: diastereoisomer features on different electrode materials and strategies for enantiomer discrimination

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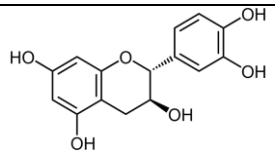
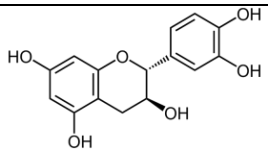
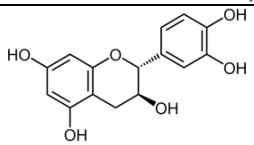
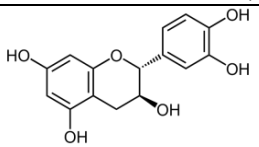
Plants and fruits as well as related foods and beverages, such as tea, wine, and fruit juices, include a variety of polyphenols, which are the object of a wide, interdisciplinary pool of studies, on account of their many beneficial effects on human health. Voltammetry is particularly appropriate for their study, providing a classification in terms of redox properties, strictly connected to their antioxidant effects. [1,2]
A very nice case study is provided by the catechin and epicatechin flavanol systematic series, of already thoroughly discussed general reactivity on GC electrode [3], realizing that they are *chiral* polyphenols, including two stereocentres, and thus resulting in two enantiomer couples in reciprocal diastereomeric relationship, *i.e.*

 (+)-catechin More common enantiomer in nature, (2-(*R*), 3-(*S*))	 (-)- epicatechin More common enantiomer in nature, (2-(*R*), 3-(*R*))
 (-)-catechin (2-(*S*), 3-(*R*)	 (+)- epicatechin (2-(*S*), 3-(*S*)

While diastereoisomers of chiral probes have different physicochemical properties and thus different voltammetry patterns on achiral electrodes (although such difference can be even too little to enable differentiation), enantiomer discrimination strictly requires implementation of an enantiopure chiral selector at the electrochemical interphase, either on the electrode surface or in the medium.
In this context, the series provides a very nice model to comparatively test both

(i) various achiral electrodes concerning the difference in CV patterns of *diastereoisomers* (+)-catechin and (-)-epicatechin at different pHs, and

(ii) various chiral selectors, concerning their *enantio*discrimination ability in the catechin or epicatechin case.

A selection of results will be presented and discussed.

[1] P.A. Kilmartin, Electrochemistry applied to the analysis of wine: a mini-review, *Electrochem. Comm.* 67 (2016), 39-42.
[2] J. Hoyos-Arbeláez, M. Vázquez, J. Contreras-Calderón, Electrochemical methods as a tool for determining the antioxidant capacity of food and beverages: A review, Food Chemistry 221 (2017) 1371–1381.
[3] P. Janeiro, A. M. Oliveira Brett, P. Janeiro, A.M. Oliveira Brett, Catechin electrochemical oxidation mechanisms, Anal. Chimica Acta 518 (2004) 109–115.