

Selective Recognition of Enantiomers/Isomers at Molecularly Encoded Metal Surfaces

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The molecular recognition of enantiomers or isomers is of utmost importance in various sectors, including sensing and synthesis of pharmaceuticals. To date, the development of concepts allowing chiral and molecular recognition is still a great challenge in terms of achieving a reliable discrimination of one enantiomer or conformation with respect to the other. Recently, we have successfully developed a series of chiral imprinted metals with mesoporous features by electrodeposition of metals in the simultaneous presence of lyotropic liquid crystalline surfactants and various chiral compounds such as the enantiomers of 3,4-dihydroxyphenylalanine (DOPA), mandelic acid, and phenylethanol¹⁻⁵. The discrimination between two corresponding enantiomers has been clearly observed using Differential Pulse Voltammetry (DPV) even after removal of the chiral templates. In addition, to further improve the efficiency of chiral imprinted metals for chiral recognition in terms of their stability, a chiral encoded Pt-Ir alloy has been obtained by co-electrodeposition of Pt and Ir in the presence of a liquid crystal phase and chiral templates. Interestingly, again a very high discrimination between two enantiomers is observed, even after applying highly positive potentials. To extend the range of applications of these designer materials, they have also been used as selective materials imprinted with different isomers to discriminate between Cannabidiol (CBD) and Tetrahydrocannabinol (THC). We report here the first example of a molecular-encoded platinum-iridium (Pt/Ir) alloy, used as a sensing layer for the selective detection of cannabinoids, including cannabidiol (CBD) and tetrahydrocannabinol (THC). To design these molecular-imprinted electrodes, an electrodeposition technique was applied, using CBD or THC model molecules as templates in the simultaneous presence of a lyotropic liquid crystal structure of non-ionic surfactants. After the complete removal of all templates, mesoporous structures containing molecular recognition sites for these two cannabinoids were obtained. The efficiency of the molecular discrimination between CBD and THC model compounds has been studied with differential pulse voltammetry (DPV), revealing a highly selective recognition of these two isomers with detection limits of 10 μM . Most importantly, the nanostructured materials can also be employed for analyzing real cannabis oil samples and the sensors can be reused several times¹. These findings open up promising perspectives in the general frame of the electroanalysis of various types of molecules ranging from chiral compounds to complex molecules such as THC and CBD at molecularly encoded metal surfaces.

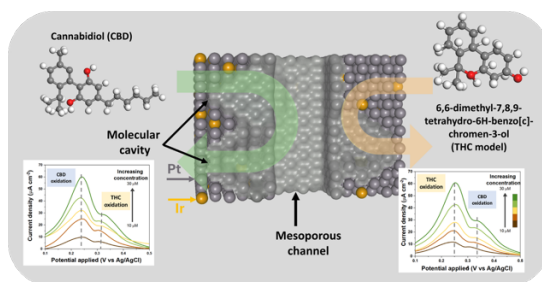


Figure 1. Schematic illustration of CBD and THC recognition on Pt/Ir alloy.

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