Studies about biological compounds and their applicability as molecular electronic devices

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The field of molecular electronics has attracted several efforts worldwide in the last decades. Build devices based on specific properties of individual molecules is a possible dream today and has become the aim of many advanced labs on almost all continents [1]. The results obtained by this field will not substitute the conventional and well succeed electronic based on silicon. They will complement this technology and build each smaller devices that consume less energy and use the properties of organic materials, as flexibility, electrical conductance, resistance, etc [1]. This is an important step towards energy efficiency and sustainability. Molecular electronics can be combined with the study of biological compounds and be used to understand many aspects of materials that are currently studied by pharmacology and chemistry but have potential applications as electronic devices and could be used to made complex devices in the nanoscale, in a not far away future [1-4]. In this work, we present some recent studies about the electronic in molecules of opioids [2], carotenoids [3], and steroids [4]. These works help us to understand the intrinsic behavior of specific classes of molecules and they provide more information about how these systems work. The main results of these studies can be summarized as: (i) the molecular symmetry and the atomic composition appoint to the potential application as a device. (ii) most of the studied molecules behave as diode or Field Effect Transistor (FET); (iii) even the most simple change in the molecular composition or the isomerism can change drastically the molecular device from diode or FET to insulator. These conclusions base future studies in this area and turn the web of interdisciplinary knowledge to each denser.

Key-words: molecular electronics; organic compounds; interdisciplinary knowledge.

References

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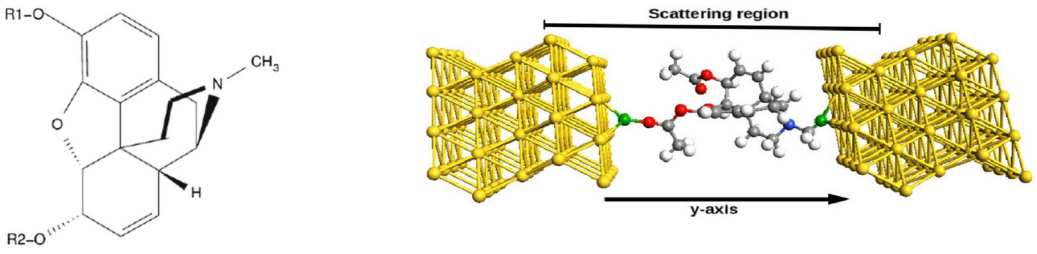
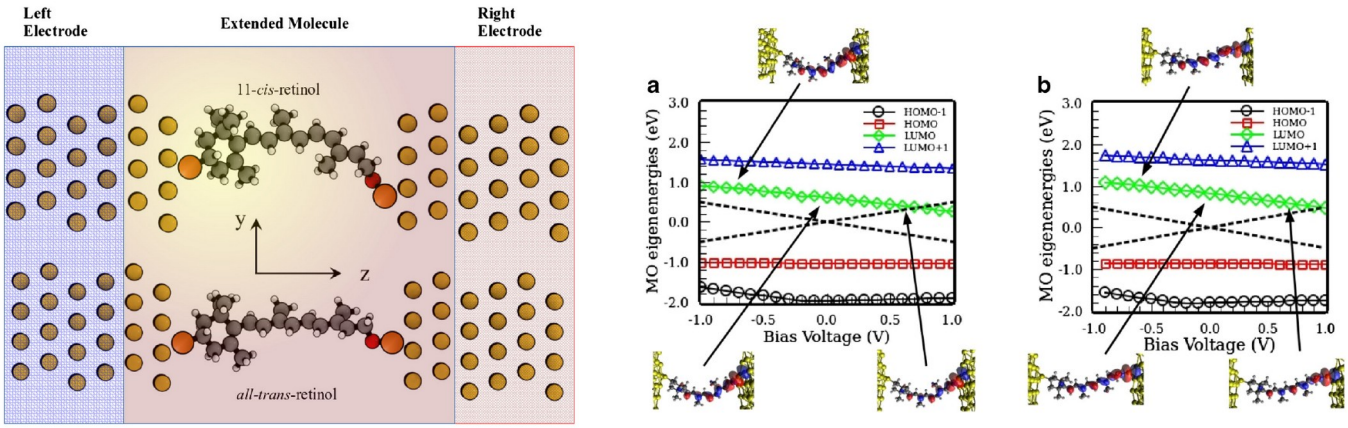


(a) (b)

Fig. 1: Structure of opioids (a) and (b) the connection scheme between Au(111) electrodes [2].



(a) (b)

Fig. 2: (a) 11-*cis*-retinol and *all-trans*-retinol connected between Au(111) electrodes under a applied bias voltage. (b) the effect of this voltage is mainly observed in the LUMO molecular orbital: 11-*cis*-retinol is most sensitive [3].

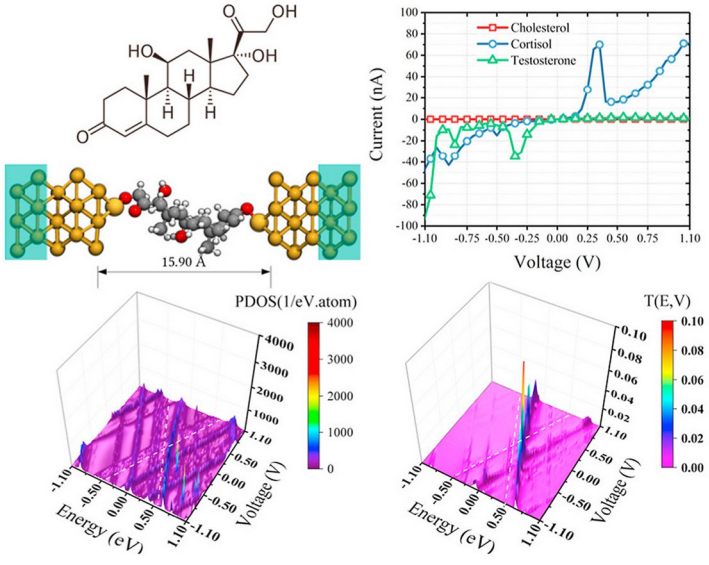


Fig. 3: Mainly results obtained for steroid simulations [4].