Electrochemistry for Smart Materials: From Molecular Electronics to Ionotronics

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The ending "tronics" was probably first used in *elec*tronics, and later in *spin*toronics and *molecular elec*tronics[1], and it generally refers to devices related to the application of the properties concerned with the first part of the word. Thus, the term *ionotronics*[2] emerged describing the systems that utilize the properties of various systems containing ions. Interfacial electrochemistry is in good position to contribute to both molecular electronics and ionotronics, as electrode electrolyte interface in any configuration allows a dramatic variation of electric field localized within 1nm with a tiny (1 V) voltage variation[3]. This could provide gating in the rectification of electrical current through single molecules or geration of electronic current in the outer circuit due to controlled change of electrical capacitance at the interface.

In this lecture I will speak about two example research fields:

1. The control of the current-voltage characteristics of the passage along single chain molecules bridging the gap between STM tip and electrode, embedded in electrolytic solution[4-8], which at the moment is yet far from direct applications in electronics, but can be easily envisaged for sensing.
2. Generation of electronic current through mechanical modulation of the double layer capacitance as a promising option for AC current generation from walking.[9-12]

Both fields have a common thread: control of electric field through the voltage control of electrical double layer, and in both cases the nature of electrode and electrolyte is of central importance.

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