

Redox-induced ion-pairing between anionic amphiphiles and ferrocenylalkanethiolate self-assembled monolayers

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The pairing of small inorganic anions (i.e. PF_6^- , ClO_4^- or BF_4^-) with the oxidized ferrocene moieties of ferrocenylalkanethiolate self-assembled monolayers (SAMs) has been extensively documented. For instance, we have exploited this phenomenon for the redox actuation of microcantilevers.^[1,2] We have also focused on the pairing of non-traditional electrolyte anions, such as anionic amphiphiles, to oxidized ferrocenylalkanethiolate SAMs.^[3]

Amphiphiles are molecules that possess a polar head group attached to a hydrophobic alkyl chain. At a certain concentration, amphiphiles can self-aggregate into micelles. These micro-structures exist in an equilibrium state with monomers (i.e., non-aggregated amphiphiles) at the critical micellar concentration (CMC). Below the CMC, only monomers exist in solution.

Using a series of anionic amphiphiles with alkyl chain lengths ranging from 6 to 12 carbons, we have found that the redox properties of ferrocenylalkanethiolate SAMs in aqueous solutions of these are completely different from those obtained in solutions containing small inorganic anions. The redox properties of the ferrocenylalkanethiolate SAMs as a function of the amphiphile chainlength and concentration will be presented and compared with those of small inorganic counter-anions.

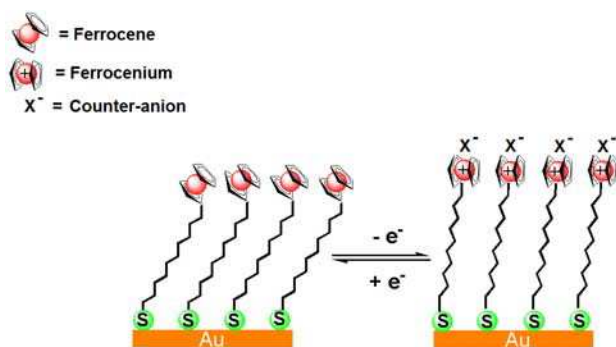


Figure 1: Schematic of ion pairing between the ferrocenium head group and an anionic counter anion.

References

- [1] Norman, L. L., Badia, A., *J. Am. Chem. Soc.* **2009**, *131*, 2328
 [2] Norman, L. L., Badia, A., *J. Phys. Chem. C* **2011**, *115*, 1985
 [3] Norman, L. L., Badia, A., *Langmuir* **2007**, *23*, 10198