

Accepted Manuscript

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PII: S1572-6657(16)30742-1

DOI: doi: [10.1016/j.jelechem.2016.12.040](https://doi.org/10.1016/j.jelechem.2016.12.040)

Reference: JEAC 3036

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 10 November 2016

Revised date: 13 December 2016

Accepted date: 23 December 2016

Please cite this article as: Cheng Fang, Mallavarapu Megharaj, Ravi Naidu , Electrochemical switch on-off response of a self-assembled monolayer (SAM) upon exposure to perfluorooctanoic acid (PFOA). The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Jeac*(2016), doi: [10.1016/j.jelechem.2016.12.040](https://doi.org/10.1016/j.jelechem.2016.12.040)

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Electrochemical switch on-off response of a self-assembled monolayer (SAM) upon exposure to perfluorooctanoic acid (PFOA)

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Abstract:

The switch on-off response of a self-assembled monolayer (SAM) on a stimulating moiety such as a surfactant is interesting but not well known. Priority research attention has been paid to a special family of surfactant, fluorosurfactants, because they have been recently listed as emerging contaminants and persistent organic pollutants. Herein we investigate the electrochemical switch on-off response of a SAM of 6-(ferrocenyl, FC) hexanethiol (C_6 -FC) upon exposure to perfluorooctanoic acid (PFOA), the most common fluorosurfactant. FC is employed as a redox probe to monitor the switch on-off response of the SAM formed on gold electrode surface. In an effort to understand the hydrophilic terminate group's influence from the surfactant, we dope the pristine C_6 -FC SAM with 6-amino-1-hexanethiol (C_6 -NH₂), 1-hexanethiol (C_5 -CH₃), or 6-mercaptohexanoic acid (C_5 -COOH) via a thiol-gold bond. We also dope it with 1-dodecanethiol (C_{11} -CH₃) or 12-mercaptododecanoic acid (C_{11} -COOH) to investigate the length effect of the carbon chain. We observe there is a similar switch on-off response either from the presence of PFOA or from the doping C_5 -COOH/ C_{11} -COOH, suggesting the insertion of PFOA into the C_6 -FC SAM, which is also evidenced by electrochemical

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