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## ELECTROCHEMICAL OXIDATION OF PERFLUOROALKENES IN FLUOROSULFURIC ACID\*\*

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The electrochemical oxidation in fluorosulfuric acid has been shown to be an effective and useful method to fonctionnalize perfluorinated organic compounds, which are generally extremely difficult to oxidize by conventionnal routes.

We have already reported such oxidations of primary linear perfluorinated compounds  $\text{CF}_3(\text{CF}_2)_n\text{X}$  with  $\text{X} = \text{H}, \text{Br}, \text{CH}_2\text{OH}, \text{CO}_2\text{H}$  and  $\text{SO}_3\text{H}$ , and of some secondary hydroperfluoroalkanes and cycloalkanes.

The present communication deals with the study of the electrochemical behaviour of perfluoroalk-1-enes in fluorosulfuric acid and of the indirect oxidation of such olefins with the peroxide  $(\text{FSO}_3)_2$ .

Linear and cyclic voltamperometric studies show that perfluorooct-1-ene  $\text{C}_6\text{F}_{13}-\text{CF}=\text{CF}_2$  is electroactive in  $\text{FSO}_3\text{H}$  ( $E_{1/2}(\text{Cu}/\text{Cu}^{2+}) = 2.01$  volts) according to an irreversible electrochemical process. Preparative direct electrochemical oxidation leads to bis (fluorosulfato) perfluoroalkanes,  $\text{FSO}_2\text{O}-\underset{\text{C}_6\text{F}_{13}}{\text{CF}}-\text{CF}_2-\text{OSO}_2\text{F}$  (I) and  $\text{FSO}_2\text{O}-\underset{\text{C}_6\text{F}_{13}}{\text{CF}}-\text{CF}-\text{CF}_2-\text{OSO}_2\text{F}$  (II)

The action of the peroxide  $(\text{FSO}_3)_2$  (preliminary prepared by electrochemical oxidation of  $\text{FSO}_3\text{H}$ ) on the olefin yields these esters in the same proportions, i.e. 25% of the 1-1 adduct (I) and 75% of the 2-1 adduct dimer (II).

Such results can be explained by the intervention of the same mechanism, an electrochemical or chemical oxidation of the olefin, in the two cases. This assumption is discussed.

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