

CATALYTIC DECOMPOSITION OF CHLOROFLUOROCARBONS AND RELATED COMPOUNDS

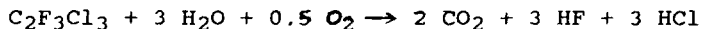
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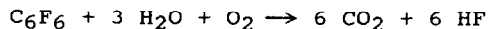
Strong evidence suggests that the so-called 'ozone hole' is caused by photodecomposition products of the CFCs. In this regard, not only the recovery technologies but also decomposition methods of used CFCs must be established urgently. Dehalogenation of CFCs have been demonstrated recently by the treatment with Na naphthalenide [1]. But usually CFCs are regarded less susceptible to destruction because of their chemical stability.

We now have found that  $\text{CF}_3\text{Cl}$  - a compound which is entirely stable in the presence of water at  $500^\circ$  and 4000 bar for a period of 12 h [2] - is hydrolyzed quantitatively in the presence of a solid acid catalyst at  $400^\circ\text{C}$  with a contact time of 0.7 s. With the same catalyst, the perhalogenated methanes  $\text{CF}_2\text{Cl}_2$ ,  $\text{CFCl}_3$ ,  $\text{CF}_3\text{Br}$  and  $\text{CF}_2\text{ClBr}$  can also be hydrolyzed according to  $\text{CX}_4 + 2 \text{H}_2\text{O} \rightarrow \text{CO}_2 + 4 \text{HX}$  ( $\text{X} = \text{F}, \text{Cl}, \text{Br}$ )

All the other CFCs are hydrolyzed and simultaneously oxidized in contact with other catalysts, which work bifunctionally, e.g.



Hexafluorobenzene is decomposed into:



Reaction mechanisms are proposed. Only the perfluoroalkanes do not react. Up to the present this is the first catalytic method known to be able to decompose CFCs and organofluorine compounds.

1 A.Oku, K.Kimura and M.Sato, Chem. Lett., 1789 (1988).

2 A.P.Hagen and E.A.Elphinstone, J.Inorg.Nucl.Chem., 36 509 (1974).