

# 고차구조형 유기산업재료 연구센터 제2회 Workshop

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HOMRC

Hyperstructured Organic Materials Research Center (HOMRC)  
Seoul National University

# Epoxidation of HFP Using Sodium Hypochlorite

이태환\*, 김흥근, 김훈식, 이희우\*

한국과학기술연구원 환경공정연구부  
\*서강대학교 화학공학과

*Polymer Materials Laboratory,  
Chem. Eng. Dept., Sogang Univ., Korea*

## Introduction

Hexafluoropropylene oxide (HFPO) is used fluorinated ion-exchange membrane such as Nafion®.

fluoropolymers

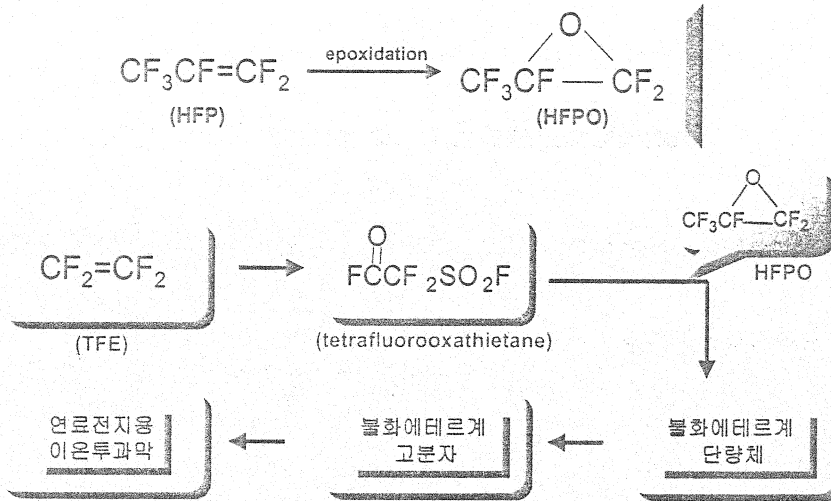
Copolymer

HFPO

physical and chemical  
properties

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## Objective



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## Preparation of HFPO

- $\text{HFP} + \text{O}_2 \longrightarrow \text{HFPO}$
- $\text{HFP} + \text{NaOX} \longrightarrow \text{HFPO}$
- $\text{HFP} + \text{H}_2\text{O}_2 \longrightarrow \text{HFPO}$
- Electrochemical Oxidation

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## HFPO via Hypochlorite

Hypochlorite reagents

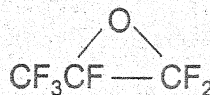
Organic Solvents

Surfactants

Hexafluoropropylene

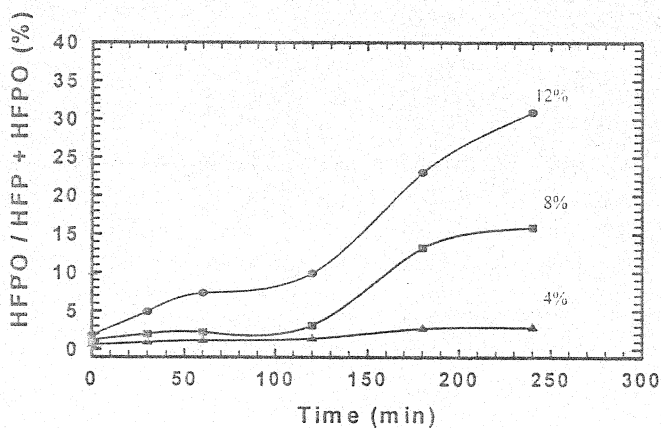


Hexafluoropropylene  
oxide



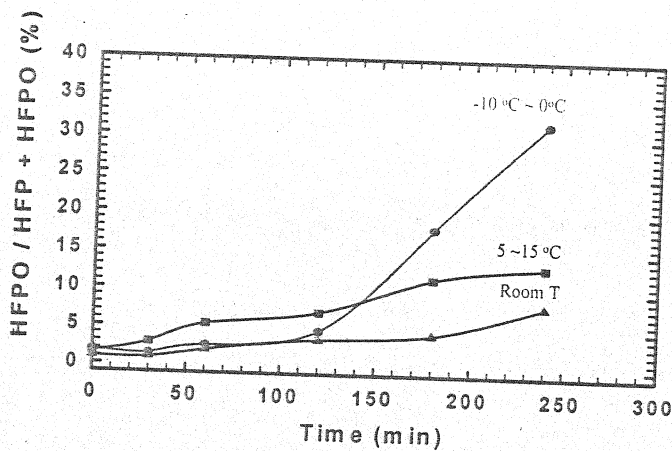
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## Effect of Hypochlorite Conv. on the Formation of HFPO



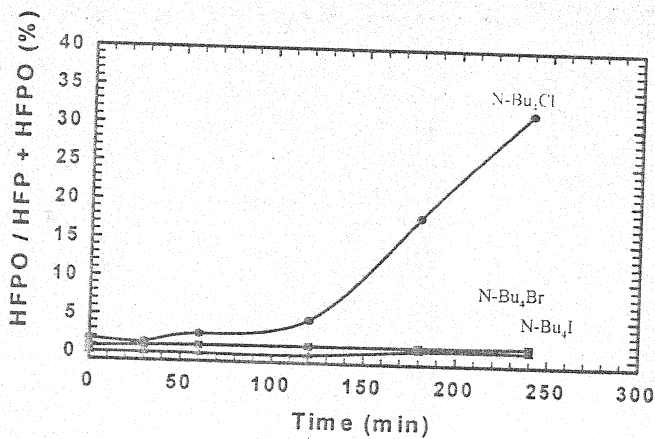
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### Effect of Temperature on the Formation of HFPO



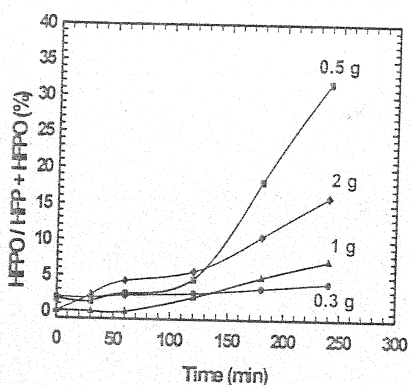
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### Effect of Surfactants on the Formation of HFPO



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## Effect of $N-Bu_4Cl$ on the Formation of HFPO



F-113 :  $N-Bu_4Cl$  = 46:1

$NaOCl$  :  $N-Bu_4Cl$  = 19:1

HFP :  $N-Bu_4Cl$  = 2.3 : 1

(molar ratio)

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## Conclusions

- HFPO is prepared for Hypochlorite method.
- HFPO was successfully obtained from a liquid-phase epoxidation of hexafluoropropylene(HFP), which occurred in the surface interface between an aqueous hypochlorite and an organic solvent, 1,1,2-trichloro-1,2,2-trichloroethane(F-113) containing HFP.
- Yield and production rate of HFPO increased along with the initial concentration of  $NaOCl$ .
- The yield of HFPO also changed with the ratio of  $NaOCl$  to F-113 and with types and concentrations of surfactant.

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