



Contents lists available at ScienceDirect

Applied Catalysis A: General

journal homepage: www.elsevier.com/locate/apcata



Metal halide catalysts to synthesize dichloropentafluoropropanes by the reaction of dichlorofluoromethane with tetrafluoroethylene

T. Tanuma*, H. Okamoto, K. Ohnishi, S. Morikawa

Asahi Glass Research Center, 1150 Hazawa-cho, Kanagawa-ku, Yokohama-shi, Kanagawa 221-8875, Japan

ARTICLE INFO

Article history:

Received 21 April 2008

Received in revised form 23 June 2008

Accepted 30 June 2008

Available online 6 July 2008

Keywords:

Lewis acid catalyst

Titanium

Zirconium

Halide

Chlorofluoride

Dichloropentafluoropropane

HCFC

ABSTRACT

A series of metal halides were studied as Lewis acid catalysts for the reaction of dichlorofluoromethane with tetrafluoroethylene to form dichloropentafluoropropanes (HCFC-225s) which are being manufactured as an alternative to CFC-113. Zirconium tetrachloride and hafnium tetrachloride had high catalytic activity in the reaction and much better selectivity towards HCFC-225ca and HCFC-225cb than conventional aluminum trichloride. The Cl-F exchange reaction of zirconium tetrachloride or titanium tetrachloride with chlorofluoromethane produced metal chlorofluorides. When chlorofluoromethane-treated $ZrCl_4$ or $TiCl_4$ were used as a catalyst the reaction of dichlorofluoromethane with tetrafluoroethylene proceeded without the induction period that was observed using $ZrCl_4$ or $TiCl_4$ without pretreatment, indicating that the metal chlorides needed an activation time to become chlorofluorides before developing catalytic activity. Trichlorofluoromethane-treated $ZrCl_4$, metal chlorofluoride, was characterized by thermogravimetry (TG), differential thermal analysis (DTA), and X-ray diffraction.

© 2008 Elsevier B.V. All rights reserved.