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Preface

CFC (chlorofluorocarbons) and halons (brominated fluorocarbons or brominated CFCs) represent a group of stable chemicals exhibiting desirable properties for a broad range of industrial and consumer applications, including refrigeration, fire suppression and manufacturing of polymeric foams. Unfortunately, most of the applications involve dispersive use of the chemicals, prompting a concerted international action, embodied in the Montreal Protocol, to limit these dispersive applications. When released near the earth surface, halons and CFCs transfer preferentially to the Antarctic troposphere, where they undergo the photochemical activation to release bromine and chlorine radicals. Subsequently, both radicals enter the stratospheric gas phase catalytic cycles responsible for the destruction of large amounts of ozone, with bromine being considerably more potent than chlorine.

The damaged ozone layer can no longer function as an efficient filter for harmful ultraviolet radiation. The realisation of the health effects of this phenomenon arose public concern and resulted in phasing out the manufacturing of the ozone depleting chemicals, imposed by the Montreal Protocol, to allow the ozone layer to recover. Several developed countries broadened the scope of Protocol to restrain the use of recycled halons and CFC. Although handful of developing countries maintain a limited production of the ozone depleting chemicals, a complete phasing out of the production is imminent.

The legislative action has been associated with the development of new technologies, which have radically transformed the halon and CFC dependent industries. Hydrofluorocarbons (HFCs) and hydrocarbons have replaced CFCs as refrigerants and blowing agents, water mist, HFCs, inert gases and foams have substituted halons as fire suppressants. Similar changes have affected other industries. At the same time, the unwanted and banned chemicals are accumulating in national banks, awaiting their final treatment. One approach to dispose the ozone depleting chemicals constitutes their burning in incinerators, cement kilns and specially designed thermal plasma reactors. However, such an approach entails energy inefficiencies, as halons and CFC exhibit high heat capacities and bond energies, and can lead to the formation of other pollutants, including dioxins and furans.

An alternative route is to selectively cleave off the C–Cl and C–Br bonds, under well-controlled catalytic conditions, if possible preserving the valuable C–F bonds. This route produces mainly HFCs, which represent desirable chemicals, either in their own right or as precursors for manufacturing other compounds, including fluoroelastomers and CF_3I. Implied in this approach is a key paradigm shift, from considering halons and CFCs as brominated and chlorinated wastes to regarding them as valuable chemical feedstocks. From this perspective, this issue collects a selection of important advances in catalytic conversion of halons and CFCs to HFCs and other chemicals. Featured articles deal with hydrodechlorination of CFC-12 (CCl_2F_2), CFC-113 ($C_2Cl_3F_3$) and CFC-114 ($C_2Cl_2F_4$), hydrodehalogenation of Halon 1211 ($CBrClF_2$), hydrolysis and dehalogenative oligomerisation of CFC-12 and synthesis of CF_3I, over a very diverse group of catalysts.

The Guest Editors enjoyed working with the contributors, referees and the Editor (Professor J.J. Spivey), and would like to express their gratitude for this pleasant experience.

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