

A-7 Development of Substitutes of CFCs and Assessment of Their Environmental Effects

Contact Person Kunimitsu Kaya
Head, Chemical Toxicology Section,
Division of Environmental Chemistry, National Institute
for Environmental Studies,
Environmental Agency of Japan.
16-2, Onogawa, Tsukuba, Ibaraki 305 Japan
Tel.: +81-298-51-6111(ext.297) Fax: +81-298-56-4678

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Recent observations, laboratory experiments and model simulations carried out these few years have strengthened the evidence that Antarctic ozone hole and the observed global ozone decreases are due to the CFCs and halons. Phaseout of CFCs earlier than 2000 is discussed at present. Therefore, importance of development of substitutes of CFCs and halons is increasing. Though private companies are very important in this field, national institutes could play essential roles in fundamental researches and risky developments for private companies. Assessment of environmental effects of substitutes is also urgent because newly developed ones might cause additional environmental problems. However, only small parts of these problems are controlled by present laws because relation between cause and effect is not clear. Therefore, researches on potential effects of substitutes on environment should be carried out comprehensively.

The objective of this study is to contribute to efforts for solving problems in development and assessment of substitutes for CFCs and halons mentioned above. This include, (1) explorations of the possibilities of non-pollution substitutes for CFCs and halons, (2) studies on the lifetime, tropospheric degradation mechanisms and secondary products of substitutes, (3) clarification of environmental effects of the substitutes in their whole life.

Results are summarized as follows:

1. High yield preparations of HCFC-253ca, fluorinated di-ethers and perfluoroamines(new halon substitutes) were achieved.
2. The rate constants for the reaction of OH with HCFCs and HFCs were determined.
3. A rapid method of toxicity test *in vitro* for substitutes of CFCs was developed.
4. Analytical systems and procedures were developed to achieve highly sensitive and precise determination of CFC alternatives in the atmosphere.