United States Environmental Protection Agency

Ozone-Depleting Substances

Additional Information

Basic Ozone Layer Science

Addressing Ozone Layer Depletion

This page provides information on compounds recognized as ozone-depleting substances (ODS) under the Montreal Protocol.

The ODS are split into two groups under the Clean Air Act: Class I ODS, such as chlorofluorocarbons (CFCs), and Class II ODS, such as hydrochlorofluorocarbons (HCFCs).

For each ODS, this page provides the compound's atmospheric lifetime, Ozone Depletion Potential (ODP), Global Warming Potential (GWP), and Chemistry Abstract Service (CAS) registry numbers.

Information on acceptable ODS alternatives (e.g., hydrofluorocarbons) is available through EPA's Significant New Alternatives Policy (SNAP) Program.

Class II ODS

Chemical Name	Lifetime, in years	ODP1 (Montreal Protocol)	ODP2 (WMO 2011)	GWP1 (AR4)	GWP2 (AR5)	CAS Number
HCFC-21 (CHFCl2) Dichlorofluoromethane	1.7	0.04		151	148	75-43-4
HCFC-22 (CHF2Cl) Monochlorodifluoromethane	11.9	0.055	0.04	1810	1760	75-45-6

Chemical Name	Lifetime, in years	ODP1 (Montreal Protocol)	ODP2 (WMO 2011)	GWP1 (AR4)	GWP2 (AR5)	CAS Number
HCFC-31 (CH2FCl) Monochlorofluoromethane		0.02				593-70-4
HCFC-121 (C2HFCl4) Tetrachlorofluoroethane		0.01-0.04				354-14-3
HCFC-122 (C2HF2Cl3) Trichlorodifluoroethane		0.02-0.08			59	354-21-2
HCFC-123 (C2HF3Cl2) Dichlorotrifluoroethane	1.3	0.02	0.01	77	79	306-83-2
HCFC-124 (C2HF4Cl) Monochlorotetrafluoroethane	5.9	0.022				2837-89-0
HCFC-131 (C2H2FCl3) Trichlorofluoroethane		0.007–0.05				359-28-4
HCFC-132b (C2H2F2Cl2) Dichlorodifluoroethane		0.008–0.05				1649-08-7
HCFC-133a (C2H2F3Cl) Monochlorotrifluoroethane		0.02–0.06				75-88-7
HCFC-141b (C2H3FCl2) Dichlorofluoroethane	9.2	0.11	0.12	725	782	1717-00-6
HCFC-142b (C2H3F2Cl) Monochlorodifluoroethane	17.2	0.065	0.06	2310	1980	75-68-3
HCFC-221 (C3HFCl6) Hexachlorofluoropropane		0.015–0.07				422-26-4
HCFC-222 (C3HF2Cl5) Pentachlorodifluoropropane		0.01–0.09				422-49-1
HCFC-223 (C3HF3Cl4) Tetrachlorotrifluoropropane		0.01–0.08				422-52-6
HCFC-224 (C3HF4Cl3) Trichlorotetrafluoropropane		0.01–0.09				422-54-8
HCFC-225ca (C3HF5Cl2) Dichloropentafluoropropane	1.9	0.025	0.02	122	127	422-56-0
HCFC-225cb (C3HF5Cl2) Dichloropentafluoropropane	5.9	0.033	0.03	595	525	507-55-1
HCFC-226 (C3HF6Cl) Monochlorohexafluoropropane		0.02–0.1				431-87-8

Chemical Name	Lifetime, in years	ODP1 (Montreal Protocol)	ODP2 (WMO 2011)	GWP1 (AR4)	GWP2 (AR5)	CAS Number
HCFC-231 (C3H2FCl5) Pentachlorofluoropropane		0.05–0.09				421-94-3
HCFC-232 (C3H2F2Cl4) Tetrachlorodifluoropropane		0.008–0.1				460-89-9
HCFC-233 (C3H2F3Cl3) Trichlorotrifluoropropane		0.007–0.23				7125-84-0
HCFC-234 (C3H2F4Cl2) Dichlorotetrafluoropropane		0.01–0.28				425-94-5
HCFC-235 (C3H2F5Cl) Monochloropentafluoropropane		0.03–0.52				460-92-4
HCFC-241 (C3H3FCl4) Tetrachlorofluoropropane		0.004–0.09				666-27-3
HCFC-242 (C3H3F2Cl3) Trichlorodifluoropropane		0.005–0.13				460-63-9
HCFC-243 (C3H3F3Cl2) Dichlorotrifluoropropane		0.007–0.12				460-69-5
HCFC-244 (C3H3F4Cl) Monochlorotetrafluoropropane		0.009–0.14				
HCFC-251 (C3H4FCl3) Monochlorotetrafluoropropane		0.001–0.01				421-41-0
HCFC-252 (C3H4F2Cl2) Dichlorodifluoropropane		0.005–0.04				819-00-1
HCFC-253 (C3H4F3Cl) Monochlorotrifluoropropane		0.003–0.03				460-35-5
HCFC-261 (C3H5FCl2) Dichlorofluoropropane		0.002–0.02				420-97-3
HCFC-262 (C3H5F2Cl) Monochlorodifluoropropane		0.002–0.02				421-02-03
HCFC-271 (C3H6FCl) Monochlorofluoropropane		0.001–0.03				430-55-7

Why are there multiple values given for the ODPs and GWPs?

The numbers in the “ODP1” column are from the Montreal Protocol. Some numbers have been updated as per amendments to the Protocol.

Data in the "ODP2" column come from *WMO's Scientific Assessment of Ozone Depletion: 2010*.[1] ODP values listed are semi-empirical and can be found in Table 5-1 of the document.

The numbers in the "GWP1" column represent global warming potentials over a 100-year time horizon. The numbers are from the IPCC *Fourth Assessment Report: Climate Change 2007* (AR4).[2] The values listed are for direct radiative forcing and can be found in Table 2.14 of the "Physical Science Basis" contribution to the report.

The numbers in the "GWP2" column also represent global warming potentials over a 100-year time horizon. The numbers are from the IPCC *Fifth Assessment Report: Climate Change 2014* (AR5). The values listed are for direct radiative forcing and can be found in Table 8.A.1 of the "Physical Science Basis: contribution to the report.[3]

References

1. WMO (World Meteorological Organization), 2011: Scientific Assessment of Ozone Depletion: 2010. Global Ozone Research and Monitoring Project —Report No. 52, Geneva, Switzerland, 516 pp.
2. IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.
3. IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp.