Natural Attenuation of Chlorinated Aliphatic Hydrocarbons (CAH) *Version 1.0*

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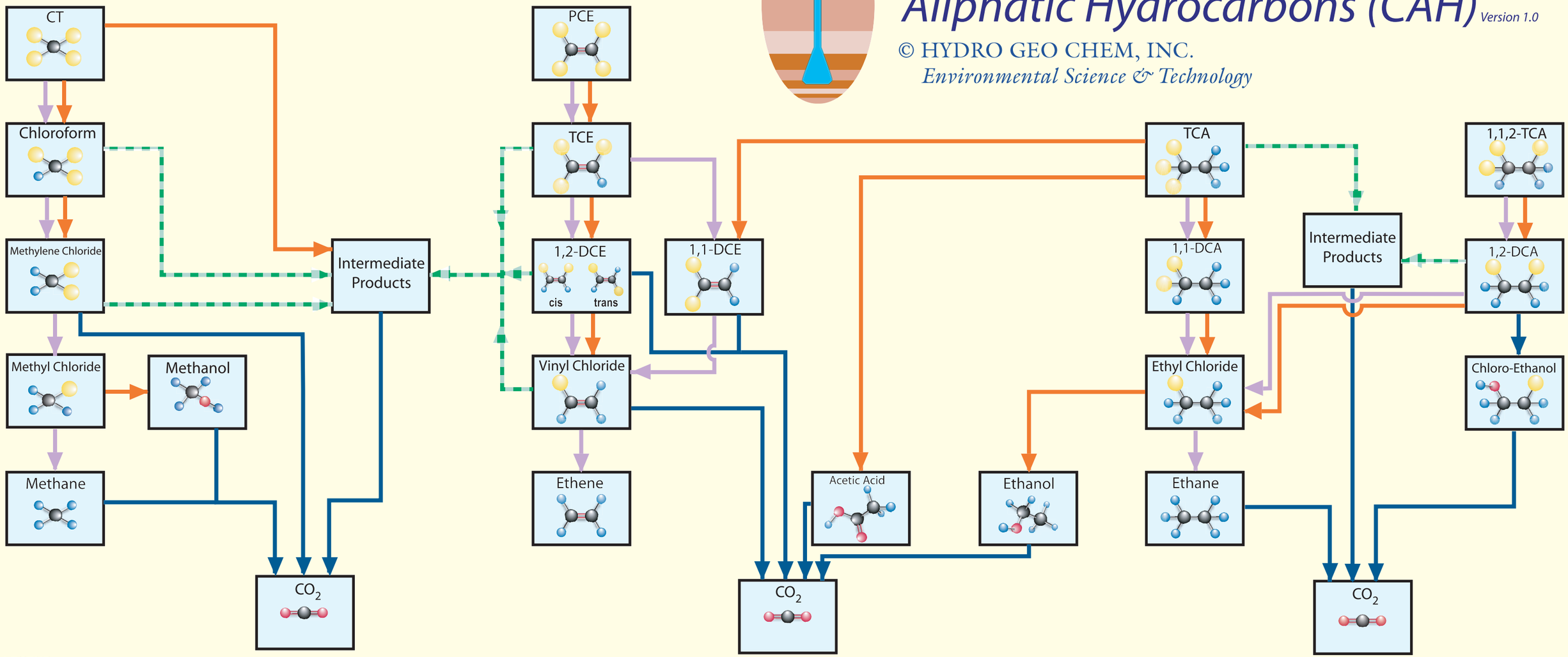

LEGEND:

- Hydrogen
- Oxygen
- Carbon
- Chlorine
- Single Molecular Bond
- Double Molecular Bond
- Abiotic
- Halorespiration
- Aerobic and/or Anaerobic Oxidation
- Cometabolism

REACTION TYPE:

ABIOTIC: REACTIONS WITHOUT MICROBIAL FACILITATION. CAH'S UNDERGO FOUR TYPES OF ABIOTIC REACTIONS; SUBSTITUTION OF OH FOR Cl (HYDROLYSIS), SUBSTITUTION OF HS FOR Cl (FROM SULFIDES), REDUCTIVE DECHLORINATION (FERROUS IRON), AND ELIMINATION OF HCl TO FORM A DOUBLE BOND (DEHYDRO-HALOGENATION).

HALORESPIRATION: ANAEROBIC REDUCTIVE DECHLORINATION DRIVEN BY HYDROGEN. IN THE CASE OF CAH'S REDUCTION REPLACES HALOGENS WITH HYDROGEN.

AEROBIC OXIDATION: CAH AS ELECTRON DONOR AND SOURCE OF ORGANIC CARBON FOR MICROBE; OXYGEN AS ELECTRON ACCEPTOR.

ANAEROBIC OXIDATION: CAH AS ELECTRON DONOR AND ORGANIC CARBON SOURCE; NITRATE, FERRIC IRON, SULFATE, OR OTHER COMPOUNDS AS ELECTRON ACCEPTORS. OCCURS IN OXYGEN-DEPLETED ZONES.

COMETABOLISM: (PARTIAL) DEGRADATION OF CAH'S BY ENZYMES FROM MICROBES GROWING ON DIFFERENT SUBSTRATES; MICROBE OBTAINS NO ENERGY IN THE PROCESS. LIMITED UNDER NATURAL CONDITIONS; CAN SOMETIMES BE ENGINEERED BY PROVIDING HIGH CONCENTRATIONS OF THE UTILIZABLE SUBSTRATE. MEASURED RATES VARY; (INCLUDES AEROBIC AND ANAEROBIC PATHWAYS).

COMPOUND PROPERTIES:

COMMON NAME	COMPOUND	CAS NUMBER	M.W.	H (atm-m^3/mol)	Log Koc
CT	CARBON TETRACHLORIDE	56-23-5	154	0.02	2.64
CHLOROFORM	TRICHLORMETHANE	67-66-3	119	0.00375	1.64
METHYLENE CHLORIDE	DICHLOROMETHANE	75-09-2	85	0.00257	0.94
METHYL CHLORIDE	CHLOROMETHANE	74-87-3	51	0.0023	0.94
PCE	TETRACHLOROETHENE	127-18-4	166	0.0227	2.82
TCE	TRICHLOROETHENE	79-01-6	131	0.00892	2.10
1,2-DCE (CIS)*	CIS-1,2-DICHLOROETHENE	156-59-2	97	0.0075	1.50
1,2-DCE (TRANS)*	TRANS-1,2-DICHLOROETHENE	156-60-5	97	0.0066	1.77
1,1-DCE	1,1-DICHLOROETHENE	75-35-4	97	0.154	1.81
VINYL CHLORIDE	CHLOROETHENE	75-01-4	62.5	0.695	0.91
TCA	1,1,1-TRICHLOROETHANE	71-55-6	133	0.00276	2.18
1,1,2-TCA	1,1,2-TRICHLOROETHANE	79-00-5	133	0.00117	1.75
1,2-DCA	1,2-DICHLOROETHANE	107-06-2	99	0.0011	1.15
1,1-DCA	1,1-DICHLOROETHANE	75-34-3	99	0.0057	1.48
ETHYL CHLORIDE	CHLOROETHANE	75-00-3	64.5	0.011	1.17

*CIS- AND TRANS- ISOMERS; CIS- FORM PREDOMINATES AS REACTION PRODUCT

GENERAL NOTES:

DISCLAIMER:
This illustrates reported biodegradation pathways for common industrial pollutants. Its use should be limited to preliminary assessment of the necessary microbiological niche for a specific biodegradation reaction to occur. The chart is NOT a comprehensive reveiw of possible reaction pathways, but rather those that are generally accepted in the literature. This image (and portions thereof) may only be reproduced by permission.

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