Climate Cooling

by Interaction of Natural (A) or Artifical (B) Loess Dust with Troposperic Methane

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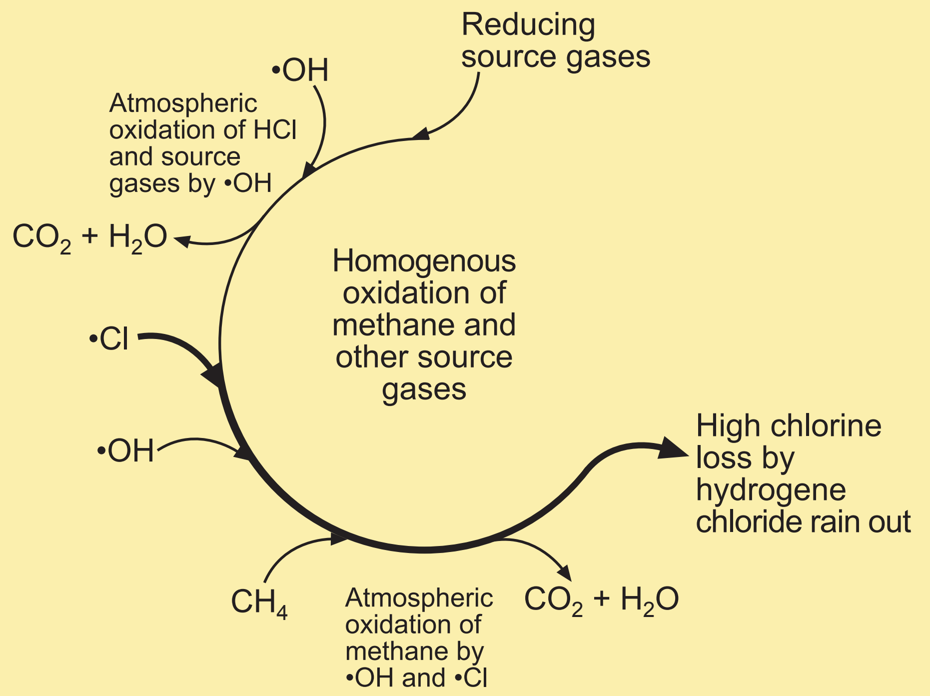
- Modelling the surface reactivity of loess dust (LD) particles: The experimental results disclose the photo-decomposition of ferric salts by sunlight radiation to ferro compounds and oxidants.
- The oxidant products of the chloro- and nitrate-salt photo decomposition are chlorine- and NO_X- radicals.
- The whole course of tropospheric chemical reactions (List 1) designate LD as a strong oxidation catalyst.
- Deducing from this findings and the now wellknown changes of tropospheric compositions during the last glacial, the tropospheric oxidant-methane interactions taking place may be divided into two principal conditions: The low LD content interglacial oxidant-methane interaction (Picture 1) and the high LD content glacial oxidant-methane ineraction (Picture 2).
- Artificial LD, generated by metal organyl additives to ship- and aircraft fuel may be some orders more active than natural LD (Picture 3).

Attachments

Picture 1

Characteristic data of troposphere with low LD content

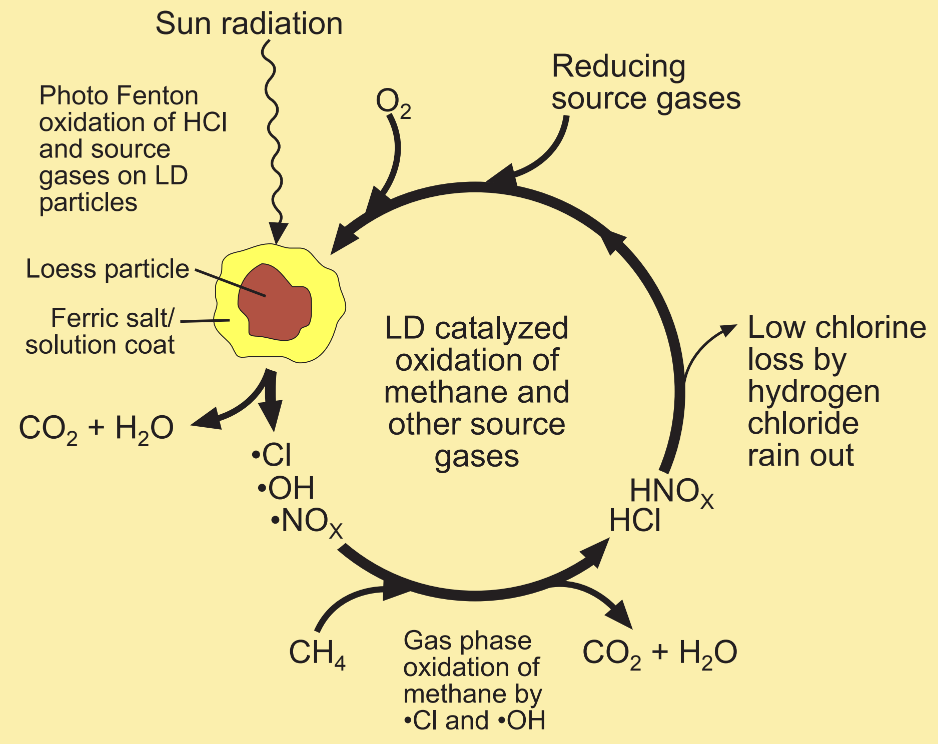
- low •Cl content
- low •OH content
- high methane content
- high content of reducing source gases
- high CO_2 content
- high temperature



Picture 2

Characteristic data of troposphere with high LD content

- elevated •Cl content
- elevated •OH content
- low methane content
- low content of reducing source gases
- low CO_2 content
- low temperature



List 1

Possible Chemical Reactions within the Photo Fenton Process on Tropospheric LD Particles

Reactions 3 - 7 and 12 to 17 are deduced from the experimental results;
Reactions 1, 2 and 8 - 11 are well known from literature

1) $HNO_{x(gas)} + nH_2O_{(LD)} \xrightarrow{\text{night only}} NO_x^-{}_{(Aerosol)} + H_3O^+{}_{(LD)}$

2) $HHal_{(gas)} + nH_2O_{(LD)} \xrightarrow{\text{night or day}} Hal^-{}_{(LD)} + H_3O^+{}_{(LD)}$

3) $Fe(III)^+{}_{(LD)} + Cl^-{}_{(LD)} \xrightarrow{\text{day only}} Fe(II)_{(LD)} + Cl\text{-}Radical_{(gas)}$

4) $Fe(III)^+{}_{(LD)} + Br^-{}_{(LD)} \xrightarrow{\text{day only}} Fe(II)_{(LD)} + Br\text{-}Radical_{(gas)}$

5) $Fe(III)^+{}_{(LD)} + NO^{3-}{}_{(LD)} \xrightarrow{\text{day only}} Fe(II)_{(LD)} + NOx\text{-}Radical_{(gas)}$

6) $Fe(III)^+{}_{(LD)} + SO4^{2-}{}_{(LD)} \xrightarrow{\text{day only}} Fe(II)_{(LD)} + HSO_4\text{-}Radical_{(LD)}$ (??)

7) $Fe(III)^+{}_{(LD)} + F^-{}_{(LD)} + H_2O \xrightarrow{\text{day only}} Fe(II)_{(LD)} + HF + OH\text{-}Radical_{(LD)}$ (??)

8) $O_{2(gas)} + Hydroquinone_{(LD)} \xrightarrow{\text{night or day}} H_2O_{2\,(LD)} + Quinone_{(LD)}$

9) $Quinone_{(LD)} + Fe^{2+}{}_{(LD)} + H_2O_{(LD)} \xrightarrow{\text{night or day}} Hydroquinone_{(LD)} + Fe^{3+}{}_{(LD)}$

10) $O_2 + TiO_{2\,(LD)} + H_2O \xrightarrow{\text{day only}} TiO_{2\,(LD)} + H_2O_{2\,(LD)}$

11) $Fe^{2+}{}_{(LD)} + H_2O_{2\,(LD)}$ **(the classic Fenton reaction)** $\xrightarrow{\text{night or day}} Fe^{3+}{}_{(LD)} + OH\text{-}Rad._{(LD)} + OH^-{}_{(LD)}$

12) $Cl^-{}_{(LD)} + OH\text{-}Radical_{(LD)} + H^+{}_{(LD)} \xrightarrow{\text{night or day}} Cl\text{-}Radical_{(gas)} + H_2O_{(LD)}$

13) $Br^-{}_{(LD)} + OH\text{-}Radical_{(LD)} + H^+{}_{(LD)} \xrightarrow{\text{night or day}} Br\text{-}Radical_{(gas)} + H_2O_{(LD)}$

14) $Cl^-{}_{(LD)} + NO_x\text{-}Radical_{(LD)} + H^+{}_{(LD)} \xrightarrow{\text{night or day}} Cl\text{-}Radical_{(gas)} + HNO_{x\,(LD)}$

15) $Br^-{}_{(LD)} + NO_x\text{-}Radical_{(LD)} + H^+{}_{(LD)} \xrightarrow{\text{night or day}} Br\text{-}Radical_{(gas)} + HNO_{x\,(LD)}$

16) $Cl^-{}_{(LD)} + HSO_4\text{-}Radical_{(LD)} + H^+{}_{(LD)} \xrightarrow{\text{night or day}} Cl\text{-}Radical_{(gas)} + H_2SO_{4\,(LD)}$(??)

17) $Br^-{}_{(LD)} + HSO_4\text{-}Radical_{(LD)} + H^+{}_{(LD)} \xrightarrow{\text{night or day}} Br\text{-}Radical_{(gas)} + H_2SO_{4(LD)}$(??)

Picture 3